The Apple II Hard Disk Primer

By

Gary R. Morrison, Ed. D.

— Published by the National AppleWorks Users Group —

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For Linda…

…who always encourages and supports
me to go one more step

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Preface

Few people who observed the development of the Apple II computer in a garage ever imagined the power Apple II computer users have today. The seemingly endless amount of RAM, increases in processor speed, and the always improving software leave us in awe when we consider how far we have come. This primer on hard disks is one more effort to help you realize the full power of your Apple II computer, regardless of whether it is an aging Apple II+ or the latest version of the IIGS.

This primer was designed to help you select, install, organize, and manage your hard disk. The idea started with a conversation I had with Warren Williams, President of **NAUG**, while I was developing RepairWorks. Warren suggested I might take on another project and write an article for the **NAUG** ***AppleWorks Forum***. What started as a short article rapidly grew into a series. The electronic mail and letters we received suggested there was a growing interest in the use of hard disks for the Apple II. Again, at Warren's encouragement, I began to rework the articles into a book. We both hope that this book helps you realize more of your potential as well as more of the Apple II's potential.

Acknowledgments

I would like to thank several individuals for their assistance and cooperation in helping me write this primer. First, I would like to thank my wife, Linda, and my children, Jenni, and Keegan, for their patience and for allowing me the time to research and write it.

Second, I would like to thank my good friend Walker Archer of QLabs and author of EasyDrive for taking the time to explain and work through many of the concepts presented in this

primer. Walker was always willing to test an idea, suggest an alternative, answer my what if's, and help compile a list of what to do.

Third, I would like to thank Joseph Gleason of Quality Computers, Chris Adams of Chinook Technology, the folks in Apple II Developer Technical Support, and Glen Bredon, author of ProSel, for providing information and answering technical questions. I would also like to thank Dave Madison of Opus 2 for convincing me that I could not live another moment without a hard disk.

Numerous friends and associates helped produce the book. I particularly want to acknowledge the work of Cathleen Merritt, Director of **NAUG**, for her numerous editorial contributions. And **NAUG**'s Nanette Luoma did the design, page layout, and all the graphics that appear in the primer.

Last, I would like to thank Warren Williams for suggesting that I write the series on hard disks in **NAUG**'s ***AppleWorks Forum*** and then to turn it into this primer. I would have done neither without his encouragement.

Gary R. Morrison
Cordova, Tennessee
May, 1990

Foreword

It occurred to me as I was reading Gary Morrison's "Hard Disk Primer" that we in the Apple II world are getting more sophisticated all the time.

Not long ago we marveled at those newfangled 3.5-inch minidisks that could hold all of 800 kilobytes worth of stuff. And now, here we are thinking about hard disk storage in terms of megabytes. Thousands of bytes versus millions of bytes. We have indeed come a long way.

So what's so important about hard disks other than storage capacity? Plenty.

For starters, speed. Hard disks let you store and retrieve files, if not in the blink of an eye, far faster than any other type of disk. There's no sitting around twiddling your thumbs waiting for large files to load.

Then there's convenience. You can store disk-fulls of programs and data files in one easily-accessible place. With a smart, well-ordered subdirectory system on your hard disk, there's no sitting around scratching your head about where you put what.

And finally, efficiency. You can switch easily between different programs on your hard disk, tapping the full power and speed of your computer—and with it your own creativity— instead of spending time searching for and swapping disks.

Like the momentous leap from horse-and-buggy to Model T, using a hard disk system ushers in a whole new era of personal productivity. Though it can seem awesome at first, it spoils you mighty fast, making you impatient with anything else.

Gary's book gets you past the awestruck stage to the comfortable-as-old-shoes stage in the shortest possible time. He begins with things to consider before buying a hard disk, explains how to install it, then describes how to work with it on a daily basis.

I particularly liked Gary's step-by-step approach to installing AppleWorks and other programs on a hard disk. When you're tackling something new (and even something not so new), it's good to have an expert at your elbow.

I enjoyed this book and learned from it. I know you will too.

Ruth K. Witkin
Long Island, New York

*[Ruth K. Witkin is inCider's "AppleWorks in Action" columnist and "a long-time **NAUG** fan" (her words). She is the author of "The Best Book of AppleWorks" (Howard W. Sams & Co.) and "Personal Money Management with AppleWorks" (John Wiley & Sons). She creates the "Success with AppleWorks" template series for IDG Communications.]*

Chapter One

AppleWorks and Hard Disk Drives: A New Adventure.

You have probably invested a significant amount of money in your Apple II computer system. Now, as your needs grow, you can add memory and other accessories to increase the speed and power of your computer and make your system easier to use.

This book is about an increasingly popular microcomputer expansion product: A hard disk drive system. This chapter will answer three of the most frequently asked questions about hard disks:

1. What is a hard disk drive system?
2. What benefits does a hard disk offer the AppleWorks user?
3. What are the disadvantages of adding a hard disk to your computer?

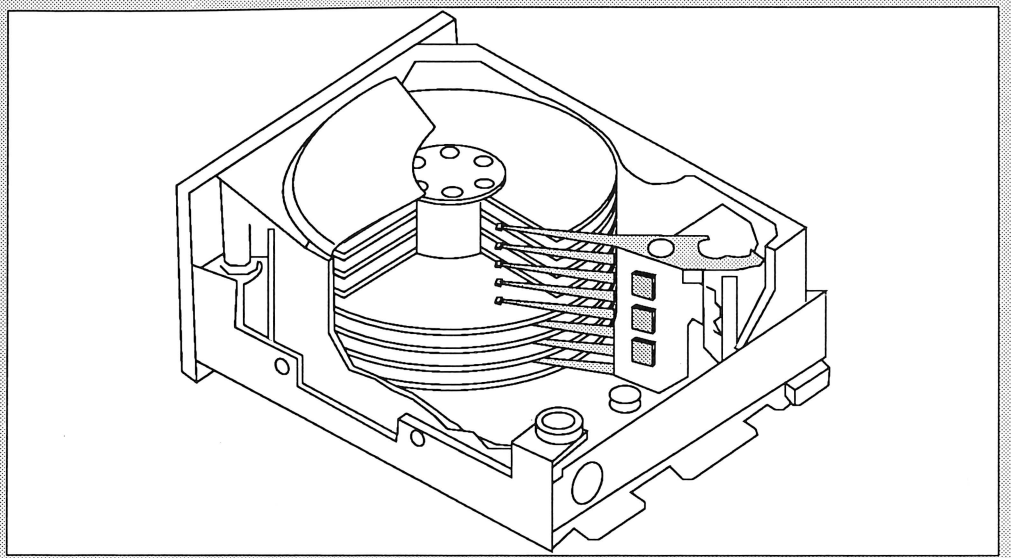
What Is a Hard Disk Drive System?

A hard disk drive system has three major components: The disk drive, the disk drive controller, and the cable. The hard disk drive consists of one or more aluminum platters enclosed in a special container to prevent environmental contamination. Each platter is coated with an oxide material similar to the coating on a floppy disk. The disk rotates at high speed within this container, and a read/write head floats just above the surface of the disk, riding on a cushion of air generated by the rapid spinning of the disk.

Figure 1.1 depicts a typical hard disk drive mechanism. *Figure 1.2* presents an enlargement of the read/write heads "floating" over the disk surface.

The disk drive controller is a card that serves as an interface between an Apple IIe or IIGS computer and the hard disk drive.

Figure 1.1: Hard Disk Drive

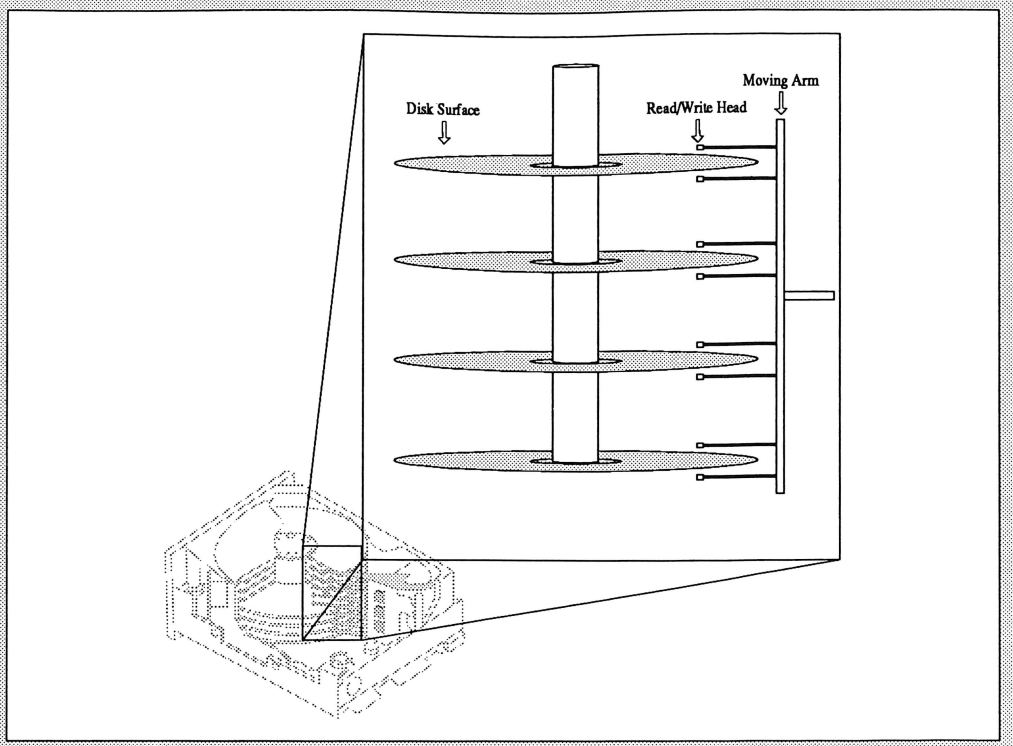


Most often the controller card goes into slot 7 in the computer. (I will describe installation procedures later in this book.) Since there is no slot to accommodate a controller card in the Apple II and IIc Plus, the few hard disk drives available for those computers put the controller card in the same case that houses the disk drive unit.

Hard disk drives use custom cables. The appropriate cable and disk controller card are usually provided with the hard disk system, but be certain to ask the vendor if these items are included in the price. A disk controller and cable can add significantly to the cost of the system.

Most hard disk systems for Apple computers are "external drives" designed to be free-standing units that sit on the desk next to the computer. At least two companies manufacture an "internal drive" that mounts in the Apple II case, but internal drives are generally less popular than external systems. Most modern external drives are about the size of Apple's original 5.25-inch floppy disk drive. (I will discuss the differences between internal and external drives in the next chapter of this book.)

Figure 1.2: Read/Write Heads in a Hard Drive



Advantages of a Hard Disk Drive System

There are two reasons to add a hard disk to your computer: Speed and convenience.

Speed: Hard disk drives are fast. A hard disk rotates about ten times faster than a floppy disk and the data is packed tightly together on a hard disk. As a result, hard disks generally operate three to four times faster than floppy disks. For example, an 85K word processor file that takes 47 seconds to load from a 5.25-inch disk and 38 seconds to load from a 3.5-inch disk, takes only 11 seconds to load from a hard disk system.

Since you can store both programs and data on a hard disk, these same speed increases are evident when you load AppleWorks into your computer's memory. For example, it takes eight seconds for AppleWorks to boot up and load onto a one-megabyte memory card from a hard disk; it takes 27 seconds to accomplish the same startup process from a 3.5-inch disk and 35 seconds plus one disk swap to boot AppleWorks from a 5.25-inch floppy disk.

Convenience: A single hard disk drive can store the equivalent of an entire collection of floppy disks. For example, a 20-megabyte drive can store as much as information as 144 5.25-inch floppy disks or 25 3.5-inch disks. You can copy your programs and data from all your floppy disks onto the hard disk and you will not have to change disks when you work. In addition, you no longer need to segment large files on different floppy disks; hard disks have the capacity to store dozens of large AppleWorks data files.

Disadvantages of Using a Hard Disk Drive

Advocates of hard disk drives would have you believe the drives are the answer to every AppleWorks owner's dream, but there are at least four disadvantages to using a hard disk system:

1. Hard disk drives are expensive. Plan on spending at least $500 for a 20-megabyte hard disk drive; $600 for a 40-megabyte system.
2. Hard disks keep all your data and programs on a single device. If that disk fails, you can lose all the files on that drive. You must plan on making floppy-disk copies of the files on your hard disk drive (a procedure called "backing up your hard disk").
3. Hard disk drives add complexity to your system. While most hard disk drives are extremely reliable, the hardware is sophisticated and does occasionally fail. In addition, you have to organize your files into subdirectories on a hard disk. I will describe the rules for pathnames and subdirectories to manage those files in Chapter 4.
4. Data on a hard disk drive requires regular "maintenance" including archiving and deleting unused files, backing up, and optimization which I will discuss later in this book.

Summary

Just like air conditioning, automatic transmissions, and microwave ovens, few people *need* a hard disk drive system. However, this accessory adds so much speed and convenience to your computer that most hard disk users find it difficult to

imagine how anyone can be happy using floppy disks. You can configure your hard disk drive to boot AppleWorks automatically and load all your TimeOut accessories. Then, you can access your data files without ever changing a disk. In addition, all disk operations are three to four times faster than a standard floppy disk-based system.

You should avoid using a hard disk drive-equipped computer unless you are prepared to buy that valuable accessory. Once you try one, you will find it difficult to revert back to floppy disks.

Chapter Two

How to Select a Hard Disk Drive.

Your decision to purchase a hard disk drive system launches you on a path that offers many choices. This chapter describes the differences between various hard disk systems and suggests the features to consider when you make this expensive purchase. By the time you are done with this chapter, you should have the information you need to make an intelligent decision between competing hard disk systems for your Apple.

Storage Capacity: A Major Consideration

Once you decide to buy a hard disk drive, you must determine the storage capacity of the drive you will purchase. In general, the more you pay, the greater the storage capacity of the drive, but the less it costs per megabyte of space. For example, let's compare three hypothetical hard disk drives: a 20 megabyte drive for $650, a 40 megabyte drive for $850, and a 60 megabyte drive for $950. Thus, the 20 megabyte drive costs $32.50 per megabyte of storage, the 30 megabyte drive costs $21.25 per megabyte, and the 60 megabyte drive costs $15.83 per megabyte. Current trends suggest that these prices will continue to drop.

The ProDOS operating system can access up to 32 megabytes on a volume or drive. However, do not think that you must limit yourself to the smaller disk drive systems; larger disk drives can be electronically partitioned to make two smaller volumes. A disk can be partitioned by changing the jumpers on the disk drive controller card (e.g., CMS' card) or with software (e.g., GS/OS software, Apple's SCSI Utilities, or Chinook's SCSI Utilities). This partitioning tricks ProDOS into thinking that you have two drives in the slot, each of which is 32 megabytes or smaller in capacity.

ProDOS sets a limit on the number of volumes you can manage, but those limits are quite liberal. If you place the SCSI card

into slot 5 of your Apple, ProDOS will be able to recognize four different volumes on your hard disk. If the SCSI card is in any other slot, ProDOS will only recognize two volumes. (ProDOS manages four volumes in slot 5 by "remapping" two of the volumes to slot 2, drive 1 and slot 2, drive 2. You can still use a modem or printer card in slot 2, but do not try to place a disk drive control card in that slot.)

While you probably find it difficult to imagine ever needing more than 32 megabytes of storage, the GS/OS operating system for the Apple IIGS is even more flexible than ProDOS. If you use an Apple SCSI-compatible hard disk and install an Apple SCSI Revision "C" or an Apple II High Speed SCSI card in slot 5 of the IIGS, you can have up to seven devices connected to that card. Thus, GS/OS lets you divide a large hard disk into seven smaller volumes, each with a capacity of 32 megabytes.

How Much Storage Should You Buy?

The size of the hard disk drive you purchase should depend on your budget, how you use your computer, and on your personality. There are two philosophies about what you should store on a hard disk. Some users take full advantage of their hardware; they store all their programs and data on the same drive. They enjoy the speed and convenience of the hard disk, but they risk losing any data files they did not back up onto floppy disks if their hard disk system fails. (I will describe procedures to back up your hard disk in Chapter 7.)

More conservative users store programs on the hard disk but maintain their data files on one or more floppy disks. These users can sleep well, knowing that they have floppy disk copies of all their program and data files. However, these users must change floppy disks while they work and do not enjoy all the speed and convenience of their hard disk system. Of course, a floppy disk could fail, but only a "few" files would be lost.

Users who store both programs and data on their hard disks need more storage capacity than those who store only programs on their system. In either case, you can estimate your current needs by adding up the size of all the program and data files you want to store on the hard disk system. A good guide-

line is 144 5.25-inch floppy disks or 25 3.5-inch disks per 20 megabytes. In addition, you should keep at least 20 to 25% of your disk space free for future expansion. If you have more than 115 5.25-inch or 20 3.5-inch floppy disks, you may want to consider a 32 or 40 megabyte drive.

Determining your future needs is a more difficult process. Remember that you cannot expand a hard disk drive; if you run out of space, you will have to add an additional drive to your computer. Also remember that you will probably need more disk space than you anticipate. For example, the AppleWorks GS program alone requires approximately 1.5 megabytes of disk storage.

Here is a starting point: If you plan to store only programs on your hard disk, you will probably find a 20 megabyte drive adequate. If you want to store both programs and data, get at least a 40 megabyte system. My GS system has a 46 megabyte drive and my IIe has a 20 megabyte system. I routinely copy old files to 3.5-inch disks and then delete them from my hard disks to reduce the "clutter".

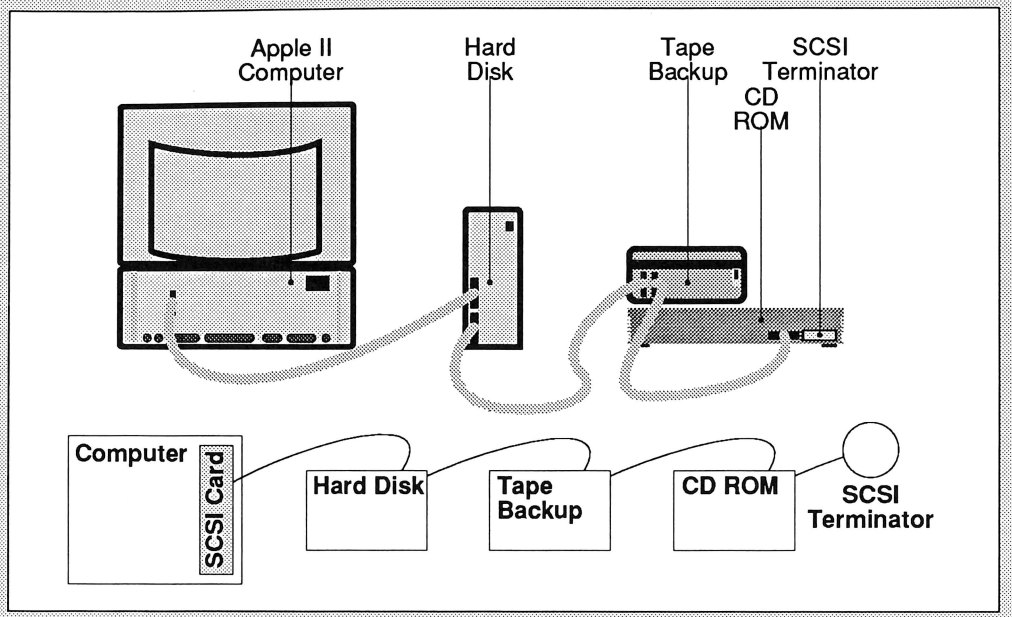
A Few Words about High Capacity Drives

The larger the hard disk system, the less expensive it costs per megabyte of storage. Thus, economics would suggest that you purchase the largest capacity drive you can afford.

That reasoning is correct if you own an Apple IIGS and plan to use the GS/OS operating system to run programs like AppleWorks GS. However, "classic" AppleWorks runs under ProDOS. Since ProDOS can only recognize two 32-megabyte volumes connected to any slot, AppleWorks can only use up to 64 megabytes on any single hard drive, even when it runs on an Apple IIGS under GS/OS.

If you own an Apple IIe, IIc, or Apple II-compatible computer, or if you plan to run only ProDOS programs like AppleWorks and the AppleWorks enhancements on your IIGS, you should avoid the temptation to buy a drive with a capacity greater than 64 megabytes. ProDOS programs like AppleWorks cannot use the full capacity of the larger hard disk system.

Figure 2.1: Daisy-Chained SCSI Devices



How Hard Disk Systems Communicate

A few years ago, the major hardware manufacturers agreed upon a standard way to connect a computer with storage devices like hard disks. The standard, called the Small Computer Standard Interface (SCSI, pronounced "Scuzzy"), specifies how a computer and disk drive system communicate. Most popular hard disk systems for the Apple II claim to adhere to this SCSI standard; they all use a SCSI interface card you must install in your computer.

Theoretically, the SCSI interface offers users three benefits: First, SCSI-compatible peripheral units can be "daisy chained" together (see *Figure 2.1*); you do not need a separate interface card for every SCSI peripheral you purchase. Second, you should be able to mix any set of SCSI-compatible products in the same daisy chain. Finally, you should be able to use any SCSI-compatible product with any SCSI interface card.

Unfortunately, computer manufacturers developed different ways to implement the SCSI standard. As a result, there are now different SCSI standards, and you must be certain that all the SCSI peripherals you buy correspond to the same standard. For example, if you buy a disk drive system that conforms to

the "Apple SCSI standard", you can connect that drive to any Apple computer (including a Macintosh). However, you cannot connect that drive to the SCSI cards sold by some other manufacturers. Nor can you mix Apple SCSI and non-Apple SCSI devices on a single daisy chain. You can mix devices from different vendors who conform to the Apple SCSI standard, but you cannot mix Apple SCSI-compatible devices with those from vendors who partially conform to the Apple standard.

In summary, if you buy an Apple SCSI interface card and Apple SCSI devices, you get all the benefits of the SCSI interface. If you purchase a non-Apple SCSI interface card, you may be limited in the peripherals you can add to your system. If you want to add other SCSI devices to your system, make certain you buy a hard disk that conforms to the Apple SCSI standard.

Speed of Operation

Hard disk systems differ in the speed with which they can store or access data on the disk. Access speed is measured in milliseconds and represents the average length of time it takes to move the head for typical read/write operations. The lower the access speed, the faster the disk drive. For example, a disk drive with an average access speed of 25 milliseconds will find data and programs on the drive about twice as fast as a disk drive with an access speed of 65 milliseconds. In general, the larger and more expensive the disk drive, the faster the access speed.

However, the access speed of the drive is only one measure of drive speed. Of more concern is how fast the data is transferred from the drive to your computer's memory or from memory to the drive. This "throughput speed" is a function of the computer, operating system, interface card, and cables. You can spend money purchasing a faster drive which, in reality, will work no faster than a slower drive due to the limitations imposed by the system. Remember, even the slowest hard disk drive is many times faster than a floppy disk system.

In addition, AppleWorks is not a disk-intensive program and AppleWorks users will rarely notice the difference between the operating speeds of the various hard disk systems. The differences are more noticeable when you use a spell checking pro-

gram; spell checkers make heavy use of a disk drive when they check the words stored in the dictionary files. Programs like AppleWorks GS are even more disk intensive; some disk drives will load AppleWorks GS noticeably faster than other drives. If you plan to run AppleWorks GS, consider a larger, faster hard disk drive system.

Drive Mechanisms

Another factor to consider is the drive mechanism. Most hard disk drive manufacturers purchase the disk drive mechanism and add the power supply, fan, and cables. If you have a preference for a particular drive mechanism, you may want to ask the dealer or manufacturer what type of drive is used.

A second aspect of drive mechanics is the air flow through the housing. While the greatest threat to a drive is dropping or bumping it, another problem is heat. Heat can shorten the life of your disk drive and lead to problems with data loss. How cool does the drive operate?

A third aspect of drive mechanics is the type of actuator. The most common actuator is a stepper motor which mechanically moves the read/write heads in discrete steps to where your data is stored. A newer actuator is the voice coil actuator, adapted from audio speaker technology, which moves the read/write heads varying amounts depending on the electrical signal sent to the motor. Voice coil actuators are typically faster, more accurate, and maintain their adjustments longer than stepper motor actuators.

External Drives and Internal Drives

Applied Engineering, Ingenuity, and Cirtech produce internal hard disk drives for the Apple II computers. Internal drives offer some advantages over external drives. First, internal drives do not require extra desk space, which may be important to some users. The drives from Ingenuity and Applied Engineering replace the power supply in the machine with a new, more powerful unit. The Cirtech drive is on a card that fits in one of the internal slots in the computer.

Applied Engineering's internal drive lets you remap the drive to any slot. For example, you may have a card in slot 6 that prevents you from using slot 7. With Applied Engineering's drive, you can place the interface card in slot 2 and tell ProDOS that the drive is accessed through slot 7.

However, there are three disadvantages to an internal drive:

1. The Ingenuity and Applied Engineering drives are not SCSI-compatible. If you need SCSI-compatibility, these drives are an inappropriate choice.
2. If the drive fails, you must remove the internal drive and attached power supply. This can be both an inconvenience and cause a work disruption. It is much easier to remove and replace an external drive.
3. The internal drives only work on one type of computer. For example, a drive that replaces the Apple IIe power supply will not work in an Apple IIGS. Thus, you lose the flexibility you gain with an external SCSI-compatible drive that you can use with an Apple IIe, Apple IIGS, or a Macintosh. The Cirtech drive offers the advantage of being SCSI-compatible and it fits in a slot rather replacing a power supply. That also means the same drive will work in a IIe and a IIGS. Cirtech's drive includes software to partition the drive, and although the drive claims SCSI-compatibility, it will not recognize partitions created with Apple's SCSI software. In addition, the Cirtech unit puts additional drain on the standard power supply built into your computer.

Other Concerns

There are other important factors to consider when you purchase a hard disk drive. If you have limited desk space, you should consider the physical size of the disk drive system. Some systems take up more desk space than others; internal drives require no extra space on your work area.

Some disk drives require you to first power up the hard disk and let it reach operating speed before you turn on the computer. Other systems let you turn on both the computer and hard disk at the same time. This feature is important for those of us

who use the on/off switch on a power strip to control the power to the computer. Drives connected to the Apple SCSI card must be powered up before the computer is turned on. Thus, if you are considering an Apple SCSI-compatible system, you will need a separate power switch for your hard disk.

While you are looking at disk drives, you might want to listen to the disk and determine how much noise it makes. Disk drives run continuously and the hum of the drive is annoying to some users. Noise can come from the fan, the internal motor that runs continuously, or during disk access when you load or save a file.

Another consideration is the portability of the disk system. Some users want to transport the disk drive between their home and office. Although this practice is not recommended (since there are some delicate parts inside the disk drive unit), some drive mechanisms are more compact than others.

All manufacturers provide a way to "park" the read/write heads in an area that does not contain data. (You should always park the heads before moving your disk drive.) Some systems park the heads automatically after a period of inactivity; others force you to park the heads manually by running a utility program that comes with the disk drive. Obviously, if you need to move the disk drive, you should try to get a system with "self-parking" heads. You might also want to consider a hard disk drive system with removable media. These drives store the data on a cartridge that typically holds 45 megabytes of data. While these drives are somewhat slower and more expensive than their fixed media brethren, the hard disk cartridges can be removed for safe transportation.

Most manufacturers of Apple II drives try to make it easy to install their systems and use their products. Many drives come formatted from the vendor, and most also come ready to boot. You can install the interface card in the appropriate slot and boot your system from the new hard disk. (Installation and configuration procedures are described in the next chapter.) If the drive is not formatted or is formatted for a Macintosh computer, you should determine which utility programs are shipped with the drive. Although the Apple II SCSI card comes with the

necessary software, it is easier to get started if you buy a drive that is already formatted and ready to use.

Finally, you will want to consider the disk management software included with the drive. Most modern disk drives come with program selectors such as ProSel or EasyDrive, and every user has his or her favorite. You can use any of the utilities with any drive, but you are likely to use what comes with your system. The program selector you use will determine how easy it is for you to switch between programs and manage your hard disk. (I will describe how to use three popular program selections in Chapter 5.)

Which Apple SCSI Card?

In early 1990, Apple announced a second generation SCSI card which replaced the older Rev C version of the card. Although both cards work with all Apple II+, IIe, and IIGS computers, the new card is much faster than its predecessor. Be sure to check that you are receiving the "Apple II High Speed SCSI Card", the newest version of the card, when you order your system.

The High-Speed SCSI card transfers data at the rate of 1 megabyte a second on the IIGS and .5 megabytes a second on the Apple IIe by using a feature called direct memory access (DMA) data transfer. This process minimizes the interaction with the computer's microprocessor and stores the data from the hard disk directly in RAM memory. The card also includes a SCSI terminator which simplifies the process of connecting hard disks and other devices to the card.

How to Select a Dealer

Deciding where to buy your hard disk is probably the single most important factor in making your purchase decision. You cannot assume that a local dealer is prepared to support and service the hard disk you want. Some dealers are familiar with hard disk systems; others provide only minimal service.

If you are an experienced computer user, are comfortable with your hardware and software, and can manage the frustrations and delays that sometimes accompany mail order purchases,

you can save money by buying from a mail order dealer. Unfortunately, you may pay a premium for the support and service of a local dealer.

As with most major computer purchases, try to pay with a major credit card instead of with a check or cash. Some hard disk drives are defective when delivered. If you pay with a credit card, you have certain rights if the disk drive is defective. Purchase by check or with cash and you will have to negotiate with your vendor.

Whether you buy from a local dealer or a mail order vendor, consider the following questions:

1. Can the dealer repair the disk drive and interface card, or must it be returned to the factory? (Most dealers return the unit to the manufacturer.)
2. What does the dealer do if the disk drive is defective upon delivery or fails within the first 30 days? (Does the dealer replace the drive or do you have to wait while it is repaired?)
3. Does the dealer offer an extended warranty program for the drive? How much does it cost?
4. What support does the dealer offer if the disk drive is out for repair? Does the dealer provide a loaner? (Most dealers do not, but you will find it is difficult to use your computer after you get used to the speed and convenience of a hard disk.)
5. Will the dealer install the interface card and test the hard disk on your computer?
6. Will the dealer partition the disk drive, configure the disk for your system, and install your software on the drive? (Note: Expect to pay extra for this service, but it is a worthwhile expense for many new users.)

What Is Most Important?

Selecting a hard disk drive is almost as difficult as determining which family car to purchase. *Figure 2.2* lists the factors I suggest you consider when you buy a hard disk.

Figure 2.2: Hard Disk Evaluation Check List

	Hard Disk One	Hard Disk Two	Hard Disk Three	Hard Disk Four	
Reliability					
MTBF (Hours)					
Apple SCSI Compatible					
Rated Capacity					
Price					
Price/Megabyte					
Access Time					
Defective in 30 Day Policy					
Dealer Repair?					
Extended Warranty					
Drive Mechanics					
Drive Type					
Actuator Type					
Fan					
Physical Dimensions					
Drive Boots with Computer					
Interface Card					
Testing before Purchase					
Setup					
Factory Formatted					
ProDOS Installed					
Partitions					
Configuration					
Installation of Software					
Loaner					
Head Parking					
Program Selector					

The most important factor is the reliability of the drive; no one wants a drive that is defective. You should talk to other users, your dealer, and technicians in various computer repair shops before making your purchase. Although the technicians may not be familiar with the particular drives you are considering, they can offer advice based on the drive mechanism (e.g., Seagate, Quantum, Conner) in the different systems. The second factor to consider is whether the drive is Apple SCSI-compatible. Capacity is the third factor to consider. Speed and price considerations are interrelated. If you are a programmer or will use the drive for a business, speed is probably more important than price. If you are a hobbyist or occasional user, then price may be more important. Price is also related to reliability since the more expensive drives are often more reliable than the less expensive units. The remaining factors vary in importance for different users. If you plan to work primarily with applications such as AppleWorks, then factory formatting and dealer installation may be more important. If you are an experienced user and are comfortable with ProDOS or GS/OS, then other factors may carry more weight.

Summary

The growing popularity of hard disks for Apple II series computers makes it possible to find a hard disk that should fit your specific needs. This chapter describes a number of factors to consider when you purchase your disk. *Figure 2.2* provides a check sheet you can use when evaluating different drives.

Chapter Three

How to Connect Your Hard Disk Drive.

Setting up a hard disk drive is a fairly simple task, but the decisions you make during the process will have a dramatic impact on the performance of your system. This chapter describes how to install and partition a hard disk drive system.

A word of caution before we begin: Each hard disk system comes with a set of instructions for installing the components. I urge you to read those instructions and this chapter completely before installing your hard disk.

What Is in the Box?

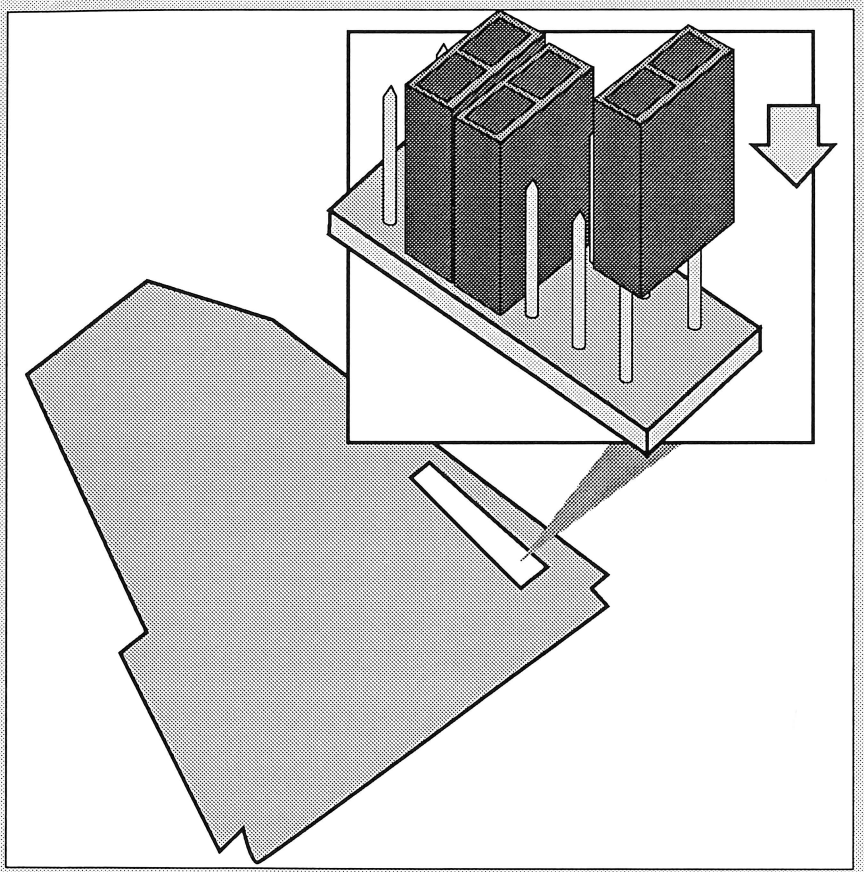
Most hard disk systems include three components: An interface card (often called a "SCSI card"), a hard disk drive, and a cable to connect the drive to the card. Your package may contain a small component called a "SCSI terminator". Finally, your system may include a disk with important utility programs.

Some hard disk systems require you to change some hardware settings before you use the drive. Examine the drive and interface card for "DIP" switches or jumper pins and blocks. (*Figure 3.1* depicts a set of jumper pins.) For example, both the Apple SCSI card and CMS interface card use jumper pins. The factory-set configuration usually works well, but read the directions to insure you set the jumpers and switches correctly for your application.

Installing the Interface Card

Now you are ready to install the interface card in your IIe or IIGS. Turn off the computer and remove the cover, but leave the power cord attached to the wall outlet or power strip (that grounds the computer). Then touch the large, metal power supply box inside the Apple II to discharge the static electricity in your body.

Figure 3.1: Jumper Pin Array



Gently insert the hard disk interface card into the selected slot of your Apple II. Many programs expect to find certain devices in specific slots. For example, you usually plug a modem into slot 2, a mouse into slot 4, and a 5.25-inch disk drive into slot 6. Slot 7 is the traditional location for a hard disk, and using this location insures that your computer will boot from the hard disk. (If you have a IIe and decide to place the SCSI card in slot 5, the hard disk will not boot if you have another disk controller, e.g., a Unidisk or 5.25-inch drive, card in slot 6 or 7. Remember, a IIe will boot from the disk drive that is in the highest numbered slot.)

Connecting the Drive

If you have an external hard disk, determine where you will place your drive. Make certain the location provides a solid, vi-

bration-free base, unrestricted airflow to cool the drive, and access to 120 volt electrical power. Then, connect the cable to the controller card and to the drive. Most cables have connectors that only fit a certain way; you cannot install these cables incorrectly. Other cables have a single colored wire that indicates the top or bottom edge of the cable; check the directions for the correct way to connect your cable. If your disk drive has an external "SCSI Terminator", attach the terminator to the unused port on the back of the disk drive.

When you select an electrical outlet for your drive, remember that all hard disks require a moment to reach full speed when you turn them on. Sider and CMS controller cards control the timing of the power-up sequence; if you use one of these cards, you can turn on your computer and hard disk at the same time with a single switch. Drives that use Apple's SCSI card require that you turn the drive on first, then wait for it to reach full speed before you turn on the computer; you should use a wall socket or separately switched outlet with these drives.

Internal hard disks are generally easy to install. Follow the directions to remove the original power supply, install the new power supply/hard disk combination, and connect the drive to the new controller card.

The physical installation of the hard disk drive system is now complete. Next, you must configure the drive and install the operating system, programs, and data files on the drive.

Pre-formatted Disk Drives

Some manufacturers (e.g., CMS and Chinook Technology) format their drives and install an operating system before shipping the equipment to the customer. You can determine if your disk drive includes an operating system by trying to boot your computer from the drive. Close the cover on the computer, turn on the power to the hard disk, and turn on the computer. If you see a program selector or the Apple IIGS Finder desktop, you can start copying programs and data onto the hard disk—a process described in the next chapter.

If Your Hard Disk Does Not Work

If your computer does not boot from the hard disk, ask the disk drive manufacturer if they pre-format their drives and install an Apple II operating system. If the company installed an Apple II operating system, you should check the interface card, power supply, and cable connections; your computer should boot from the drive.

If you have an Apple IIGS, confirm that the Control Panel is set correctly. Press Control, Open-Apple, and Escape to call up the Desk Accessories menu, then select "Control Panel". Check under the "Slots" item. The Control Panel should say "Slot 7 (or the slot of your controller card): Your Card" and "Startup Slot: Scan". Most hard disk installations are simple; if you have a problem installing your system, it is time to contact your dealer or the manufacturer's technical support staff.

Customizing Your Hard Disk System

While many disk drives come ready to use, you should consider customizing your system. Customization involves partitioning the disk into separate volumes, installing an operating system, and installing a program selector software. In the remainder of this chapter, I will describe how to partition a disk into separate volumes. The next chapter describes how to install an operating system, how to install program selector software, and how to create an appropriate subdirectory structure for the disk.

Drive Partitions

While you do not have to partition a hard disk drive into separate volumes, you probably should partition the drive. Here's why: ProDOS can access a maximum of 32 megabytes in each "volume" or segment of a disk drive. If your hard disk drive can store more than 32 megabytes, you must partition the drive into smaller volumes to use the full capacity of the drive.

Even if you have a 20-megabyte drive, you should consider partitioning the drive. Partitioning the drive lets you keep your programs and data files in separate "volumes". The advantage

of maintaining separate volumes for data and programs becomes evident when you backup the disk. The backup process is time consuming; it takes about 30 minutes to backup a 20-megabyte hard disk using 3.5-inch disks. However, there is no reason to make backup copies of your program files on the hard disk. (If your disk fails, you still have the original program disks you copied onto the hard disk.) If you create two separate volumes, say a 10-megabyte volume for your programs and a 10-megabyte volume for data, you can save time by backing up only the files on the data volume.

If you partition the disk, each volume will need its own name; I suggest short names like HARD1 and HARD2 or PROGRAMS and DATA for each volume on the disk.

Partitioning the drive will destroy all the data or programs on the disk, and if you partition your drive, you will have to reinstall the disk operating system and any utilities supplied by the manufacturer on the drive. Despite that inconvenience, I highly recommend that you partition the drive.

How to Partition the Drive

The procedures you follow to partition a drive vary from system to system. Some hard drives come pre-partitioned; you cannot change this pre-partitioned structure. Other drives use switch or jumper settings on the interface card to establish partitions. And still other systems use software that comes with the drive or interface card to establish partitions.

I will describe five of the most popular ways to partition a drive. However, you must review the manual that came with your hard disk and interface card to determine the procedures to use with your particular system.

Method 1: Hardware—CMS drives define the partitions by changing the location of the jumpers on the controller card. You partition these drives by moving the jumpers on the interface card; the company provides directions in the manual that accompanies the system.

Method 2: Proprietary Software—Sider D2 drives come with a utility program that lets you partition the disk. Turn off the

hard disk and boot your Apple with the Sider Utilities Disk. Then, turn on the power to the hard disk and follow the directions on the screen. The Sider D2 lets you format each partition in a different operating system. That accommodates older DOS 3.3 programs and Pascal-based programs. Most AppleWorks users should maximize the size of the ProDOS partition and minimize the size of all volumes on the disk.

Method 3: Apple SCSI Utilities—Apple's SCSI Interface Card comes with a Utilities Disk that lets you format and partition a drive. If you have an Apple IIe and purchase an Apple Computer or Chinook Technology drive (both use the Apple SCSI Interface Card), you should turn off your hard disk, boot your Apple with the SCSI Utilities Disk, turn on the power to the hard disk, and follow the directions on the screen.

Method 4: GS/OS Advanced Disk Utilities—Apple IIGS users can use the GS/OS partitioning program to partition their hard disk drive. Unlike the SCSI Utilities, GS/OS lets you partition the drive into as many as seven different volumes (the SCSI Utilities Disk allows only two). You must use an Apple SCSI Card to partition your drive with GS/OS. (Although all Chinook drives are Apple SCSI-compatible, early systems were supplied with a proprietary SCSI interface card; you cannot use the Chinook interface if you want to partition a Chinook drive with GS/OS.)

You need the complete GS/OS software ($49 from Apple dealers with documentation or $12 plus $2 shipping from **NAUG** with minimal documentation) to perform this task. Follow these steps to partition your drive with GS/OS:

1. Turn on the hard disk drive.
2. Insert the GS/OS System Disk in a 3.5-inch drive and boot the computer from that drive.
3. If you have two 3.5-inch drives, insert the System Tools Disk in the second drive. Otherwise, replace the System Disk with the System Tools Disk.
4. Double-click on the System Tools Disk icon.
5. Double click on the "Adv.Disk.Util" icon to launch the Advanced Disk Utilities program. GS/OS may ask you to swap disks; follow the on-screen directions.

6. Issue an Apple-I command to indicate "Initialize". A dialog box will appear.
7. Click on "Volume" until the picture of a hard disk appears on the right-hand portion of the screen.
8. Click on "Partition". (If "Partition" is not available, your hard disk system is not fully Apple SCSI-compatible and cannot be configured with GS/OS.)
9. Decide how many volumes you want and the size of each volume. Enter the name of the first volume and drag the scroll bar so the volume is the correct size.
10. Click "New" to accept the first partition.
11. Specify additional volumes as needed.
12. When you finish defining the volumes, click on "Partition".
13. GS/OS may now ask you to specify the operating system for each partition. For AppleWorks, AppleWorks GS, and most applications, select ProDOS. However, you can specify other operating systems if they appear on your menu. Click "Initialize" for each volume you specified.
14. Press an Apple-Q to Quit from the Advanced Disk Utilities.

Method 5: Chinook SCSI Utilities—Chinook Technology markets a collection of powerful SCSI utility programs that can partition your drive. One program on the Utilities Disk does a "low level format" of the hard disk. That changes the basic structure of the sectors on the disk and is required if you buy a non-Apple II formatted SCSI drive (e.g., a drive formatted for use on a Macintosh computer). This same program also helps advanced users select the appropriate interleave factor of the sectors on the disk. (Most computers cannot keep up with the speed that a hard disk can read data. The interleave factor spaces the data on the drive so the hard disk system reads the data at a speed that is more efficient for your computer.)

The Chinook SCSI Utilities also let you partition a hard disk into different volumes. And another program on the Utilities Disk will check your hard disk for bad blocks. (A bad block is a section on the disk which is unreadable and cannot be used.)

This utility tells ProDOS that a block is bad so ProDOS does not try to store data in that portion of the drive.

Follow these steps to format and partition a drive with the Chinook Utilities:

1. Boot the utility disk and select your SCSI drive from the first menu.
2. If you need to format your drive, select option 3 (Format Drive), from the main menu. You can be safe by selecting a 1:1 interleave.
3. The next step is to partition your drive (you may want to refer to the earlier discussion concerning the number of partitions to specify). Normally, you will select two partitions. You can delete a preselected partition by highlighting it and pressing Open Apple-D. Partitions are added by pressing Open Apple-A on the partition after your new partition.
4. You can also change the name and size of a volume by highlighting the volume name and pressing the Return Key. You can then increase the volume size by pressing Open-Apple-Up Arrow and decrease the size by pressing Open-Apple-Down Arrow. Press the Return Key when you are done.
5. After you make all these changes, highlight item 1, INIT VOLUMES MARKED BY '->' and press the Return Key. The utilities will partition your drive.

Summary

Your hard disk is now ready to accept programs and data. The next chapter describes how to install an operating system on the drive and how to organize your disk.

Chapter Four

How to Install an Operating System and Organize Your Hard Disk Drive.

Like most application programs, AppleWorks does not know how to operate your disk drives. All programs use an "operating system" to manage the drives, so you must always load an operating system into your computer's memory before you can use any other program.

Disk Operating Systems

There are a number of operating systems available for the Apple II; the most popular are ProDOS (for "Professional Disk Operating System") and GS/OS (for "Apple IIGS Operating System").

ProDOS works on any Apple II or Apple II-compatible with at least 64K of memory. GS/OS is a larger, more powerful system that only works on Apple IIGS computers. Thus, Apple IIGS owners can boot their computers with either ProDOS or GS/OS. GS/OS includes a complete copy of ProDOS as part of its larger system, so you can run AppleWorks on the IIGS even when you use GS/OS.

When you run AppleWorks from a floppy disk drive, you boot the computer with an AppleWorks Startup Disk that contains ProDOS. This process loads ProDOS into memory before the computer starts running AppleWorks. Each floppy disk that you boot must include a copy of a disk operating system. If you try to boot one of your AppleWorks data disks or any disk that does not contain ProDOS, your computer will tell you that it cannot load ProDOS and will wait for you to boot with an appropriate disk.

Hard disks are faster than floppy disks, so once you own a hard disk, you should change your method of operation and boot the computer from the hard disk system instead of from a flop-

py disk. Thus, you should install a copy of the operating system onto the hard disk drive.

Which Operating System Should You Install?

If you use an Apple IIe, IIc, or Laser computer, you should install the latest version of ProDOS. Apple IIGS owners can install either ProDOS or GS/OS, although I recommend installing GS/OS, which is more powerful, lets you run both 8-bit programs like AppleWorks and 16-bit programs like AppleWorks GS, and includes a complete copy of ProDOS.

How to Get an Operating System

You will want the latest version of which ever operating system you choose. Start by contacting your Apple dealer, local users group, or **NAUG** to determine which version is current. These same sources can supply copies of the system software. For example, the latest version of ProDOS is generally available at no cost from dealers or for $4 plus $2 shipping from the **NAUG** Public Domain Library.

The larger GS/OS operating system is more expensive. GS/OS costs $49 from Apple dealers or $12 plus $3 shipping from the **NAUG** Public Domain Library. The version from the dealer includes comprehensive documentation; the copies from **NAUG** include the complete operating system but minimal documentation.

How to Install ProDOS

You can use any file copy program to install ProDOS. Just copy the files PRODOS and BASIC.SYSTEM onto the main directory of the hard drive. If you partitioned your drive into two or more volumes, copy these files onto the first volume. You do not need these files on your other volumes, since you only boot the computer from the first volume.

How to Install GS/OS

GS/OS consists of numerous files on two 3.5-inch disks and is more difficult to install than ProDOS. Fortunately, Apple in-

cludes an installation program that installs GS/OS on your drive. Follow these steps to install GS/OS:

1. Boot your computer with the GS/OS System Disk. (You may need to go to the Control Panel, select "slots" and change your startup slot to the 3.5-inch drive.)

   If you have a SCSI hard disk drive or a 3.5-inch Unidisk, you will need to copy the appropriate drivers to the 3.5-inch System Disk before continuing. (You may need to delete the sample files from the disk to provide room for these new drivers.) If you have a SCSI drive, use the Finder to copy the SCSI.Manager and SCSIHD.Driver files from the System/Drivers directory of the System.Tools disk to the System/Drivers directory of the System Disk. Similarly, if you have a 3.5-inch Unidisk you should copy the UNIDISK3.5 file to your System Disk. Failure to do so will cause the Installer to generate an error message.

2. Eject the System Disk and insert the System Tools Disk.

3. Double-click on the System Tools Disk.

4. Double-click on the "Installer" icon.

5. Click on the "Volume" button until the program displays the correct volume at the top of the screen. You want to install GS/OS on the first volume on the hard disk, the volume you probably called HARD1 or PROGRAMS.

6. Click on "Latest System Files" and then on "Install". The Installer script will install the necessary files on your hard disk. Attempting to install GS/OS by dragging the files to the hard disk could result in problems; it is always best to let the Installer do the work for you.

7. Click on "Add New Fonts" and then click on "Install" to install the basic system fonts on your hard disk. Next, click on "Advanced Disk Utility" and click on "Install". Repeat this process to install each of the accessories you own. For example, most AppleWorks users do not have an Apple MIDI card, so you should not install that device driver on your copy of GS/OS.

There will be a number of options you don't know whether or not you own. If in doubt, install the option. It's better to waste a little space on your hard disk than not have a driver you need when you use your computer.

8. Click on "Quit" to indicate you are done using the Installer program.

Test Your Setup

Now, it is time to see if your hard disk system works. Warm boot your computer by holding down the Control and Open-Apple Keys; then press and release the Reset Key. Your system should boot from the hard disk drive. If you have a IIGS, make certain you access the Control Panel and change the startup slot to "Scan".

ProDOS: If you installed ProDOS, the screen should show the BASIC prompt ("]") and the flashing cursor. If it does not, you should determine if you have a physical problem with your setup or a faulty installation of ProDOS and BASIC.SYSTEM on the disk. (If you have a program named STARTUP in the volume directory, BASIC.SYSTEM will run that program and will not display the BASIC "]" prompt.) If the disk drive activity light comes on, the physical setup is probably correct. If the disk drive light does not come on, check if the drive is getting power and if you seated the drive interface card firmly in slot 7. If you have a IIGS, make certain the interface card setting on the Control Panel says "Scan". If the drive light comes on but your computer does not boot, make certain you installed the operating system and BASIC.SYSTEM into the correct volume on the hard disk drive.

GS/OS: If you installed GS/OS, the screen should display the GS/OS Finder desktop, with icons of your disk drives at the right-hand edge of the screen. Move the mouse and see if the pointer moves. If the screen appears and the pointer moves, you probably installed GS/OS correctly. Otherwise, check that the interface card setting on the Control Panel says "Scan"; then repeat the installation process.

Organize Your Disk

There is one more important step before you can store programs and data on your hard disk; you must establish a structure of "directories" and "subdirectories" for each volume. There are at least two reasons you must use these structures:

First, a hard disk has tremendous capacity. (You can store approximately 1,000 two-page AppleWorks word processor documents on a single 20-megabyte hard disk.) But, how will you find the correct file? Can you imagine scrolling through a list of 1,000 files every time you tell AppleWorks you want to "load a file onto the desktop"?

Second, AppleWorks uses the ProDOS operating system, which limits the number of files it can store in a single directory or subdirectory. Current versions of ProDOS can store 51 files in a Main Directory. AppleWorks allows approximately 160 files in each subdirectory, so you will have to establish subdirectories if you want to use the full capacity of your hard disk system. If you try to save a fifty-second file in the volume directory, the operating system will tell you that the volume is full even though you might have 29 megabytes of unused storage capacity! Careful planning is important if you want to use the full capacity of your disk.

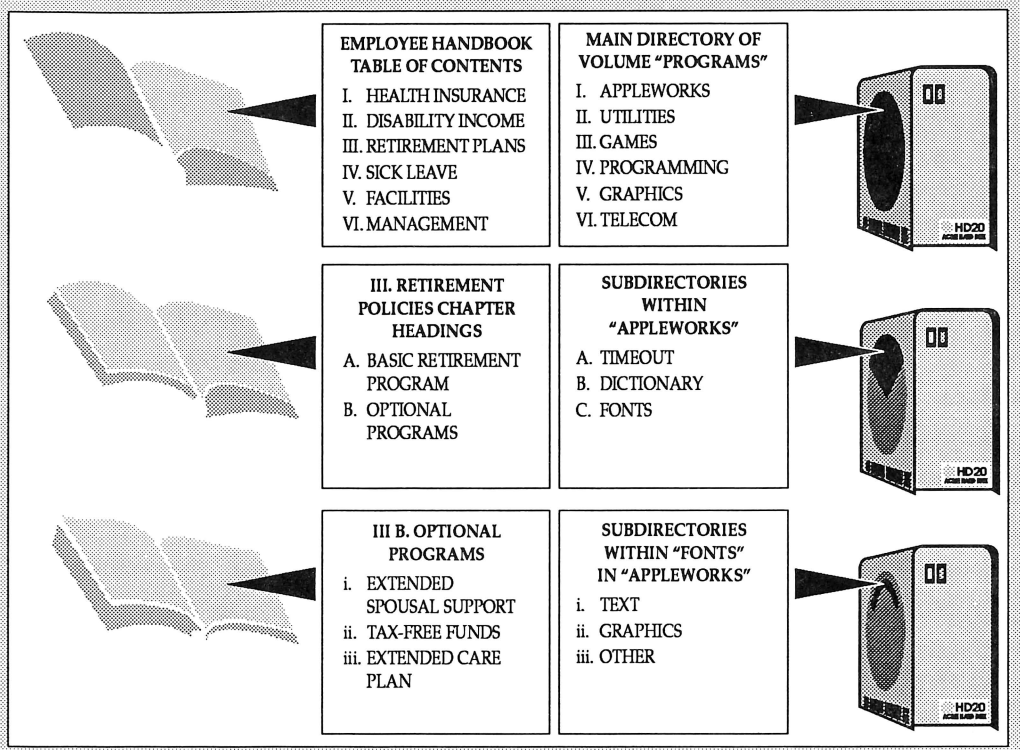
But what are directories and subdirectories?

Directories and Subdirectories

Directories and subdirectories are part of an indexing system that help you locate a specific file stored on a single hard disk. This organizational structure corresponds to the Table of Contents one might find in a large reference book like an Employees Handbook.

Consider the indexing scheme in an Employees Handbook. Imagine that the book consists of ten major sections: health insurance, disability income, retirement policies, sick leave policies, and so forth. The main Table of Contents includes a reference to each section. When you turn to the section on Retirement Policies, you find a Table of Contents for that section that includes two entries: References to the basic retirement plan

Figure 4.1: Hierarchical Structure of Books and Hard Disks

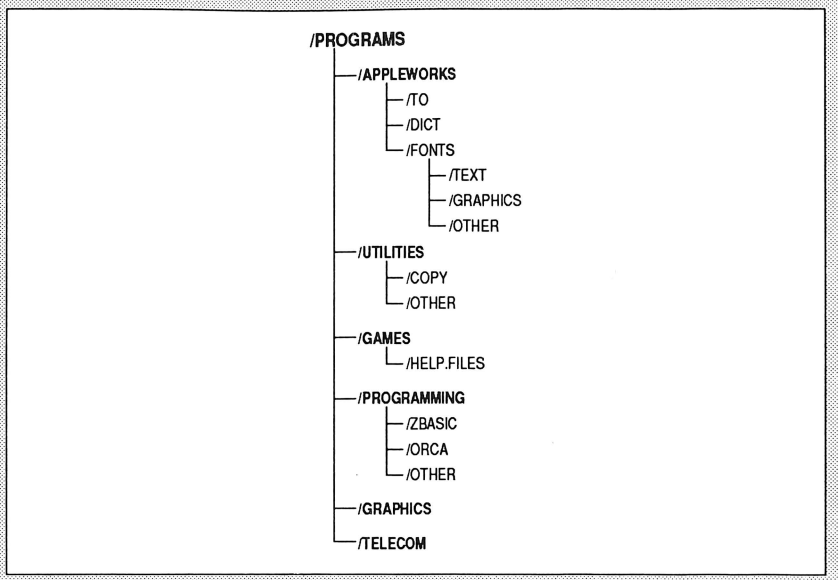


and to the optional plans. The optional plans are further divided into three sections for each option. *Figure 4.1* depicts the Tables of Contents in this Handbook.

You can think of your hard disk like a large manual that needs some type of organization. The hard disk has a "Main Directory" that functions like a Table of Contents. The Main Directory lists the major sections (called "subdirectories") and the files stored in the directory volume. Each subdirectory includes a list of files in that area. If a section of the book is too large, the author can divide that section into separate sub-sections, each of which has its own Table of Contents. Thus, each volume on your hard disk has one Main Directory and numerous subdirectories. Each subdirectory contains a list of files and/or subordinate subdirectories. The right-hand portion of *Figure 4.1* depicts a simple subdirectory structure used to organize the data files on a hard disk system.

You want to be able to visualize the structure of the subdirectories on your hard disk without drawing the pictures that ap-

Figure 4.2: Hard Disk Directory "Map"



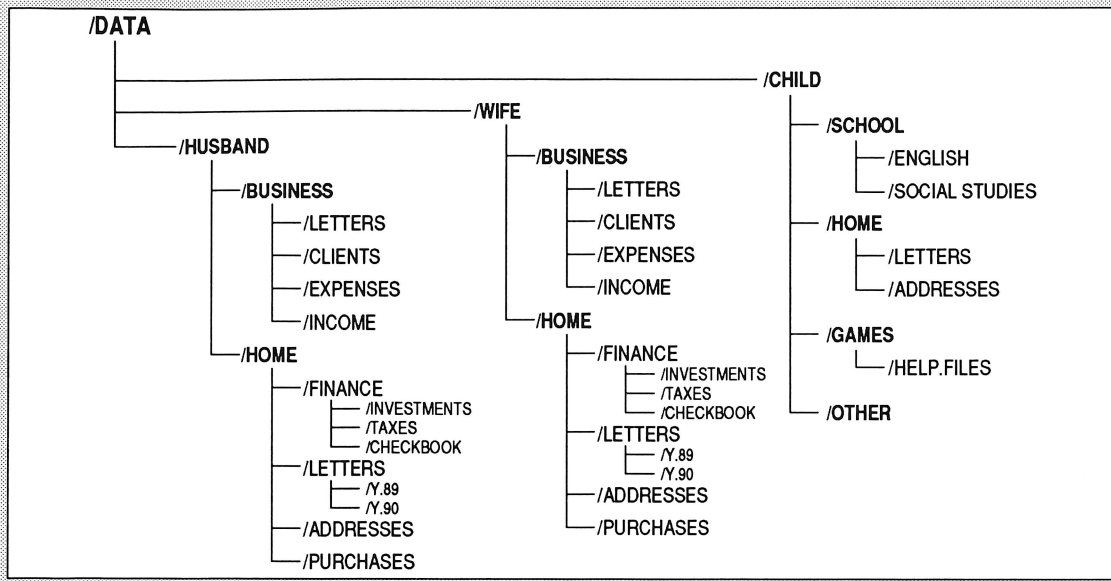
pear in *Figure 4.1*. *Figure 4.2* shows a "map" of the directories on one volume of a hard disk system. The top of the map displays the name of the volume, /PROGRAMS. This map indicates there are six subdirectories in the Main Directory: /APPLEWORKS, /UTILITIES, /GAMES, /PROGRAMMING, /GRAPHICS, and /TELECOM.

The lines extending down from each subdirectory indicate further divisions of each subdirectory. For example, the subdirectory /APPLEWORKS contains three subdirectories called /TO (for TimeOut), /DICT, and /FONTS. The subdirectory /FONTS contains three subdirectories called /TEXT, /GRAPHICS, and /OTHER. From this point on, I will use this mapping technique to depict the subdirectory structure for a disk drive volume.

Establish a Structure for Each Volume

Your next task is to establish a subdirectory structure for each volume on the disk. Let me suggest a simple strategy. Sort all your floppy disks into two piles: program disks and data disks. Set the data disks aside for now and work with the program disks. Figure out which program disks "go together" and sort the program disks into different piles. For example, you should have AppleWorks and all the TimeOut disks in a single pile.

Figure 4.3: Extended Structure for Volume "/Data"



You should have Copy II+ and all your other utility programs in a separate pile. If you use a page layout program like Publish It!, put your page layout program disks in a third pile. Place all your programming languages and utilities in another pile.

Now repeat the process with your data disks. If more than one person uses the computer, put each person's disks in a separate pile. Then sub-divide each person's pile in a meaningful fashion. Consider the recommended subdirectory structure for data disks that appears in *Figure 4.3*. Note that I group the files first by who uses the file and then by the file's function. Some AppleWorks users prefer to group all word processor, data base, and spreadsheet files into separate subdirectories, but I prefer to group the files by their use, not by the AppleWorks module I use with each file.

Rules for Subdirectory Names

Now it is time to create the subdirectories on each volume of your hard disk. Every subdirectory name must follow certain rules. That is, subdirectory names can be up to 15 characters long, must start with a letter but can have numbers after the first letter, and cannot contain spaces or punctuation marks other than a period.

While subdirectory names can include up to 15 characters, try to keep the subdirectory names short (see the section on pathnames for problems that can occur if your name uses all 15 characters). Use abbreviations and other techniques to help you shorten these names; that saves typing when you have to enter ProDOS pathnames with AppleWorks.

I prefer to keep as few files in my main volume directories as possible. For example, on my /DATA disk I have only two subdirectories: /AW and /DEVELOP. All my AppleWorks files are stored in various subdirectories under the /AW subdirectory, and all my software development projects are under the /DEVELOP subdirectory. I use a similar format for my /PROGRAM disk. One subdirectory, /APP, has all my applications such as AppleWorks, TimeOut, and my telecommunications software. Another subdirectory, /PROG, includes all my compilers and assemblers I use for software development.

How to Create ProDOS Subdirectories

You can use a disk utility program like Copy II+, the System Disk that came with your computer, ProSel, EasyDrive, or TimeOut FileMaster to establish ProDOS subdirectories. Here are the steps necessary to use Copy II+ to establish subdirectories; you can generalize these techniques to any popular disk utility program.

1. Boot your computer from the hard disk drive. The BASIC "]" prompt and flashing cursor should appear on the screen.
2. Insert your Copy II+ disk in a drive and type "-UTIL.SYSTEM,S6,D1" (This assumes you put Copy II+ in the drive connected to slot 6, drive 1. Substitute the correct slot number and drive number for your setup. Do not type the quotation marks). Then press the Return Key.
3. The Copy II+ Main Menu appears on the screen. Select "Create Subdirectory".
4. Copy II+ displays a list of all the disk drives connected to the computer. Select slot 7, drive 1.
5. Copy II+ displays a "map" of the subdirectories on your drive. Since you have not yet established subdirectories,

only the volume name appears on the screen. Press the Return Key.

6. Enter the name of the first subdirectory and press the Return Key. Repeat this process as often as necessary to set up all the first levels of subdirectories. If you want to set up a subdirectory within a subdirectory, repeat step #5, but highlight the subdirectory you want to divide.

You can also use EasyDrive's Tree Surgeon and ProSel's Cat.Doctor to create subdirectories on your hard disk. Cat.Doctor requires you to enter the full pathname at a prompt.

Tree Surgeon displays a tree diagram of the hard disk. You highlight the volume directory name or subdirectory name and press the "+" Key. Tree Surgeon will prompt you for the subdirectory name and create it in the directory you highlighted. Next to the Finder, Tree Surgeon is the easiest way to create subdirectories.

How to Create GS/OS Subdirectories

While you can use any of the disk utility programs to establish a structure of subdirectories under GS/OS, I suggest you use the GS/OS Finder and the mouse to create the subdirectories.

GS/OS uses the Apple IIGS desktop metaphor of "icons" and "folders". An "icon" is a picture that represents a device or document. A "folder" is a subdirectory that holds other folders (subdirectories) or files. Follow these steps to use the GS/OS Finder to establish subdirectories on one volume. Then repeat the steps to establish subdirectories on any remaining volumes.

1. Boot the computer from the hard disk and wait for the GS/OS Finder desktop to appear on the screen. If you partitioned your disk drive into separate volumes, the desktop will present a separate icon for each volume.

2. With the Finder desktop on the screen, move the mouse so the pointer is on the icon for one volume and double-click. A directory of the files on the volume will appear on the screen.

3. Hold down the Command Key and press the letter "N" to create a new folder. The folder will automatically be named

"UNTITLED". This creates a new subdirectory in the main directory of the volume.

4. Type a new name for the folder and press the Return Key. The name you enter can be up to 15 characters long. It must start with a letter and include no blank spaces or punctuation other than a period.
5. You can create additional subdirectories within this folder by issuing another Command-N. To create a subdirectory within a subdirectory, double click on a folder. That folder will be empty. Then issue a Command-N and name the new folder.
6. When you are done creating subdirectories within this folder, click on the "Close Box" in the upper left-hand corner of the window until you remove all the folders from the desktop. Repeat this process as necessary to create all the subdirectories on the volume.

How to Delete ProDOS Subdirectories

There will be times you change your mind and want to delete one or more subdirectories from a volume. However, most utility programs only let you delete a subdirectory that is "empty" (i.e., a subdirectory that has no files or other subdirectories in its catalog). With these programs, you must first delete all the files in the subdirectory before you can delete the subdirectory itself.

Copy II+ and ProSel-16 are exceptions; they let you delete a subdirectory and all its associated files in a single operation. To delete subdirectories with Copy II+, select "Delete Files" from the Copy II+ Main Menu, then highlight the next higher directory on the disk map. Select the subdirectory you want to delete, and Copy II+ will delete the files from that subdirectory and then delete the subdirectory itself from the disk.

An example will clarify this process. Look at the diagram in *Figure 4.3* and imagine you want to delete the /LETTERS subdirectory from the Husband's portion of the disk. To delete that subdirectory, select Delete Files from the Copy II+ menu and highlight /BUSINESS under the /HUSBAND area. Then press the Return Key. Copy II+ will present a list of all the files and

subdirectories in the /BUSINESS subdirectory. Highlight /LETTERS and press the Return Key. Then press the letter "G" (for "Go"). Copy II+ will delete any files in /LETTERS and will then delete the /LETTERS subdirectory from the disk.

Be cautious when using Copy II+ to delete subdirectories. It gives no warning that you are about to delete all files and associated subdirectories from the disk when you delete a complete subdirectory.

If you use ProSel-16, select Utilities from the ProSel Main Menu and then specify the subdirectory to delete. ProSel will ask if you want to delete all the files in the subdirectory or subdirectories. When you approve, it will delete the files.

You can also use EasyDrive's Tree Surgeon to delete empty subdirectories. Highlight the subdirectory in the right-hand window and press the "-" Key. Tree Surgeon will delete the subdirectory if it is empty. You must delete all the files manually before Tree Surgeon will delete the subdirectory.

How to Delete GS/OS Subdirectories

It is easy to delete subdirectories (folders) in GS/OS. Here's how:

1. Boot your computer to get to the GS/OS Finder desktop.
2. Use mouse movements and clicks to display the folder you want to delete. Do not open that folder.
3. Put the arrow on the folder you want to delete, press the mouse button, and drag the folder to the trash. Then release the mouse button.The trashcan bulges to indicate it contains data you want to delete from the disk. However, the computer does not actually delete the files until you select "Empty Trash" from the GS/OS "Special" menu, or launch a program. Be cautious when you delete a folder; make certain you don't unintentionally delete important files from the disk. If you delete an important file, double-click on the trash icon; if you see the folder's icon in the trash, drag it back to the hard disk.

Summary

You can now boot your computer from your hard disk and get into BASIC. You have established subdirectories on the drive and are ready to copy your program and data files onto your system. But don't copy your files yet; there are some additional techniques you can learn. The next chapter describes the rules for creating filenames, explains pathnames and prefixes, and explains how to install disk management software on your hard disk.

Chapter Five

How to Use Hard Disk Management Software.

Your hard disk is like a business; it needs a good management plan to function efficiently. In this chapter, I will describe the skills you need to manage your hard disk drive. By the end of this chapter you should understand filenames, pathnames, and prefixes. In addition, you should know how to install a disk management program on your hard disk drive.

ProDOS Filenames

In the last chapter, you installed an operating system on your hard disk. Apple IIe and IIc owners installed ProDOS, Apple IIGS owners installed GS/OS. You also divided each volume on your hard disk into directories and subdirectories. Now, some additional background will help you manage the files you store in the subdirectories on your disk.

You must follow certain conventions when you assign names to files. Fortunately, both ProDOS and GS/OS follow the same conventions, and these rules apply to every file on your disk, including program files, data files, and ASCII or DIF files.

Here are the rules for assigning names to files:

1. Every filename must begin with a letter.
2. All other characters can be either letters, numbers, or periods. You cannot use spaces, symbols, or punctuation marks other than a period in a filename. (Note that you can enter spaces within a filename in AppleWorks, but AppleWorks replaces each space with a period when it saves your file, thus the file "NEW DATA" becomes "NEW.DATA" on your disk. AppleWorks does not include the period when it displays the filename.)
3. Filenames can be up to 15 characters long.

Figure 5.1: Correct and Incorrect Filenames

Filename	Correct
HOME	Correct
home.ba	Correct
ACCOUNT.1	Correct
ACCOUNT 1	Incorrect. Spaces not allowed in filenames.
1ACCOUNT	Incorrect. All filenames must start with a letter.
ACCOUNT.MAY.JUNE.89	Incorrect. Name is longer than 15 characters.

Figure 5.1 includes examples of correct and incorrect ProDOS and GS/OS filenames.

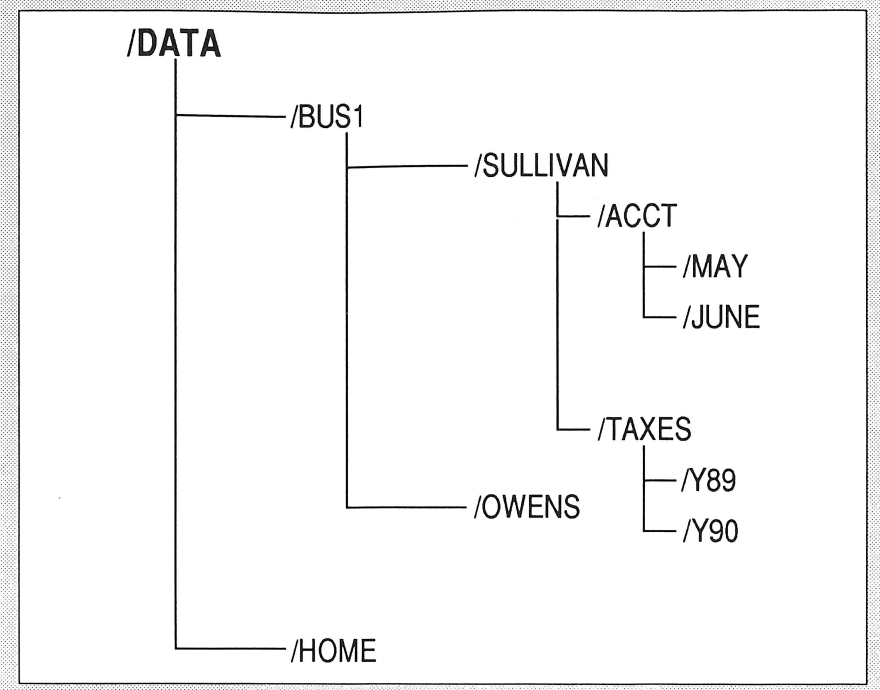
You should try to assign meaningful names to your files; that can be difficult with the 15-character limit imposed by ProDOS and GS/OS. Therefore, you should use meaningful abbreviations you can remember.

Pathnames

As you know from the previous chapter, you should subdivide your hard disk into different segments called "subdirectories". These subdirectories make it easier to find a file on the disk. *Figure 5.2* depicts the subdirectory structure of a disk called "DATA". First, I created subdirectories in the main volume. I called these subdirectories "BUS1" and "HOME". I subdivided the /BUS1 subdirectory into two subdirectories, called "SULLIVAN" and "OWENS". Then I further subdivided the "SULLIVAN" subdirectory into two subdirectories called "ACCT" (for "accounting") and "TAXES". Finally, I saved two files called "MAY" and "JUNE" in the "ACCT" subdirectory and two files called "Y89" and "Y90" in the "TAXES" subdirectory.

When I want the file "JUNE", I must tell AppleWorks the "path" to that file. Pathnames are like directions. Suppose someone asks you for directions to the post office. You might reply "Go down Main Street to Elm, turn left on Elm, continue to Second Avenue, and make the first right." You described the "path" to the post office. The path would be /MAIN/ELM /SECOND/POST.OFFICE.

Figure 5.2: Hard Disk Subdirectory



Similarly, ProDOS and GS/OS use pathnames to locate the files stored in different subdirectories on the disk. A pathname begins with the volume name and includes all the subdirectories between the volume name and the file. For example, in *Figure 5.2*, the pathname to the June accounts file is /DATA/BUS1 /SULLIVAN/ACCT/JUNE.

There are three rules for pathnames:

1. They must begin with a slash and the volume name.
2. You must separate each segment of the pathname with another slash.
3. ProDOS accepts pathnames up to 64 characters long, but AppleWorks only lets you enter up to 48 characters in a pathname.

   Thus, you can see the importance of using short names for your subdirectories and files. If you use long names, you might not be able to access the files in a subdirectory. For example, assume that you have a subdirectory for your Time-Out Macros called /GARY.MORRISON/APPLICATIONS/

APPLEWORKS3.0/TIMEOUT3.0/MACROS. All the subdirectories are "legal" ProDOS names, but the macro files will be limited to 3 letter filenames. Why? ProDOS limits a pathname to 64 characters. The above pathname is 60 characters long. You will need a slash after "MACROS" and that leaves only 3 characters for the filename. The easiest solution is to rename the subdirectories. A new pathname might be /GM/APP/AWKS3/TO3/MACROS.

Prefixes

A prefix is a pathname that consists of the names of the subdirectories leading to a file, but not the name of the file itself. For example, the prefix for the spreadsheet named "JUNE" in *Figure 5.2* is /DATA/BUS1/SULLIVAN/ACCT. By specifying this prefix, you can access the files in the ACCT directory by entering only the filename; you do not have to enter the complete pathname to the file. When a program asks for a prefix, you should enter the pathname up to, *but not including*, the filename.

Remember, all filenames and subdirectory names must follow the rules for ProDOS and GS/OS filenames. A pathname includes the complete route to the file, including the filename. A prefix lets you specify the path to all the files in a specific directory. We will use these concepts later as we set up our hard disk.

Hard Disk Management Software

When you followed the steps outlined in the previous chapters, you formatted your disk and installed either ProDOS or GS/OS. The next step is to install disk management software on the hard disk.

Do You Need Disk Management Software?

One advantage of floppy disks is that they are easy to manage. You rarely need to subdivide your files into subdirectories, therefore you usually don't deal with pathnames and prefixes. In addition, you generally keep each program on a different disk, so all you do to change programs is to insert the correct disk in the drive and boot your computer.

The mode of operation is different with a hard disk where you store programs in different directories on a single, large storage device. With a hard disk, you "launch" (or start) your programs with the GS/OS Finder or with ProDOS commands. The popularity of hard disks and the difficulty of keeping track of the files on those disks spawned a new genre of software, called "disk management packages". These programs help you structure and locate the files on your hard disk drive. Disk management packages include: program selectors (that let you launch different programs from your hard drive without the need to enter pathnames and ProDOS commands), and management utilities (that let you copy files to and from your hard disk, delete files, rename files, create subdirectories, and back up and restore files on your hard disk system). The three most common disk management programs are the Finder, EasyDrive, and ProSel.

The Finder only works on the Apple IIGS.

EasyDrive 1.x is an 8-bit program that runs on any Apple II-compatible system. While you can use these versions of EasyDrive to launch 16-bit programs that run only on the Apple IIGS, you might encounter some incompatabilities with these programs as you work. For example, a problem with version 5.02 of GS/OS causes the spreadsheet module in AppleWorks GS to lock up when you launch the program from EasyDrive or any other 8-bit program selector. EasyDrive 2.0 and later is fully compatible with GS/OS and all 8-bit and 16-bit programs.

There are two versions of ProSel: ProSel-8 and ProSel-16. As the titles suggest, ProSel-8 is an 8-bit version of the program. ProSel-16 is the 16-bit version of ProSel that is compatible with all 16-bit software such as AppleWorks GS. If you have an Apple IIe, IIc, or compatible, you must use ProSel-8. Although you can use either version of the program to run 8-bit programs such as AppleWorks on a IIGS, I suggest you use ProSel-16 if you installed GS/OS on your hard disk.

Using the Finder

The Finder is a part of GS/OS; you installed the Finder when you installed GS/OS on your hard disk. The Finder is a visual, mouse-driven disk management program that uses Apple's

desktop metaphor. You use the mouse to move a pointer to an icon and double-click the mouse on the icon you want to "open". For example, to execute AppleWorks, you double-click on the appropriate icons until the file APLWORKS.SYSTEM appears on your screen, then you double-click on the APLWORKS.SYSTEM icon. (The easiest way to learn how to use the Finder is from the Apple IIGS System Disk User's Guide that came with your computer.)

The Finder has three advantages over other disk management programs: (a) it is graphically based and easy to learn, (b) it is free, and (c) you do not have to install the Finder; it automatically appears on your desktop when you install GS/OS. Unfortunately, the Finder lacks some important features built into the other disk management programs. While many IIGS owners use the Finder, I recommend you install either EasyDrive or ProSel to manage your hard disk. EasyDrive and ProSel are fast, inexpensive, text-based, menu-driven programs with easy-to-use program selectors, and powerful disk management utilities.

How to Install EasyDrive

Follow these steps to install EasyDrive:

Apple IIe or IIc:

1. Boot your computer from the hard disk. That leaves you with the BASIC prompt on the screen.
2. Put the EasyDrive disk in Drive 1. Type PR#6, and press the Return Key.
3. Press the Escape Key when the EasyDrive Main Menu appears on the screen.
4. Use the Arrow Keys or mouse to select "Install" on the top menu bar and press the Return Key. That will display the installation screen.
5. EasyDrive now displays a list of volumes currently on-line and asks where you want to install EasyDrive. If you used the volume names recommended in this series of articles, use the Up-Arrow and Down-Arrow Keys to highlight the volume named PROGRAMS and press the Return Key.

6. The next question asks which operating system to install. You already installed your operating system, so select "None".

EasyDrive will install itself and all its utility programs. When installation is complete, you will see the EasyDrive Main Menu.

Apple IIGS:

1. Boot your computer; the Finder desktop appears on the screen.
2. Insert the EasyDrive program disk in a disk drive and double-click on the drive icon to display the contents of the disk.
3. Double-click on the file EZINS.SYSTEM to display the EasyDrive Installation Menu.

Now continue with steps 5 and 6 in the Apple IIe/IIc directions above. (EasyDrive will automatically rename the start file in the system subdirectory to FINDER. This file is the GS FINDER which you can add to your EasyDrive menu.)

How to Install ProSel

There are two versions of ProSel; ProSel-8 that runs on any Apple II computer and ProSel-16 designed for the Apple IIGS. Here are the steps necessary to install each version of the program:

ProSel-8 on an Apple IIe or IIc:

1. Boot the computer from the hard disk.
2. Insert the ProSel program disk in Drive 1.
3. Enter the command "PREFIX /PROSEL/UTIL" and press the Return Key.
4. Enter "-INSTALL.PROSEL" and press the Return Key.
5. ProSel asks for the name of the volume where you want to install ProSel. If you followed the setup in the last chapter, enter "/PROGRAMS". (Remember to type the slash before PROGRAMS.)

6. Select "Full Installation" from the menu choices.

ProSel will install itself on your hard disk and display the ProSel Main Menu. Now you should select the option that prints the ProSel documentation. ProSel includes a powerful set of utility programs; you will want the documentation so you can use the utility programs on the disk.

ProSel-16 on an Apple IIGS:

1. Boot the computer from the hard disk. Wait until you see the Finder desktop.
2. Put the ProSel-16 disk in a drive and double-click on the icon for that drive. You should see a list of the files on the ProSel disk.
3. Double-click on the SYSTEM folder on the ProSel disk.
4. Double-click on the START file within the SYSTEM folder. You will see the ProSel-16 Main Menu.
5. Enter a "G" and press the Return Key.

ProSel will install itself on your hard drive and will display its Main Menu. Select the choice that prints the documentation.

ProSel-8 on an Apple IIGS:

AppleWorks and all AppleWorks-compatible enhancements, are 8-bit programs that do not use the 16-bit operating system built into GS/OS. As a result, many AppleWorks users install ProSel-8 on their Apple IIGS computers. While I recommend that you install ProSel-16 on your IIGS, follow these steps if you want to install ProSel-8 on your system:

1. Boot your computer from the hard disk and wait for the Finder desktop to appear.
2. Put the ProSel disk in a drive and double-click on the icon for that drive.
3. Double-click on the folder labelled "UTIL".
4. Scroll through the list of files in the UTIL folder until you find the file "INSTALL.PROSEL", then double-click on that file.

5. ProSel asks for the name of the volume where you want to install ProSel. Enter "/PROGRAMS". (Remember to type the slash before PROGRAMS.)

6. Select "Full Installation" from the menu choices.

Another option is to boot GS/OS, but use ProSel-8. You will first need to install GS/OS, then follow the instructions for installing ProSel-8 on an Apple IIe. After completing the installation, rename the START file in the System folder to Finder (this is the GS/OS Finder program). You can delete it, but I prefer to keep a copy of the Finder available. Next, copy the START file from your ProSel-8 disk into the System directory of your hard disk. When you boot, this START file will launch ProSel-8 after GS/OS boots.

Summary

This chapter explained pathnames, filenames, and prefixes. It also described how to install two popular disk management programs, EasyDrive and ProSel, which make it easier to use your hard disk.

The next chapter will describe how to install and modify AppleWorks and other applications to run on your hard disk system.

EasyDrive is available from Quality Computers, 20200 Nine Mile Road, St. Clair Shores, Michigan, 48080; (800) 443-6697.

ProSel-8 and ProSel-16 are available from Glen Bredon, 521 State Road, Princeton, New Jersey 08540.

Chapter Six

How to Install AppleWorks on a Hard Disk Drive.

In the last chapter, you learned how to organize your hard disk and how to install a program selector. This chapter describes how to install AppleWorks and TimeOut on the disk. When you complete this procedure, you will be able to boot your computer from the hard disk and run AppleWorks. I will assume you already installed EasyDrive, ProSel, or the Finder on your system.

You should use your working copy of AppleWorks for this installation. You will have to re-install TimeOut later in this process, but you will not have to reconfigure AppleWorks or re-install your memory expansion software.

This installation is a four-step process:

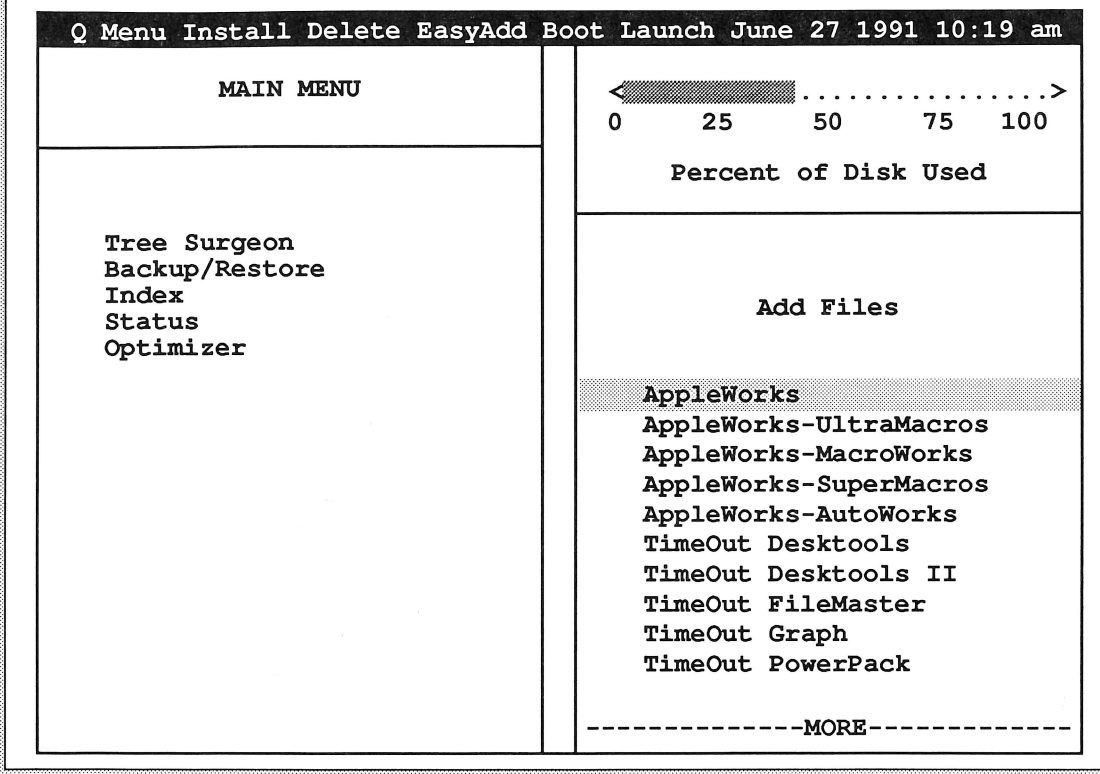
1. Copy AppleWorks into the appropriate subdirectory on the hard drive.
2. Create a subdirectory to hold the TimeOut modules.
3. Re-install the TimeOut enhancements.
4. Install the TimeOut modules on the hard drive.

Installing AppleWorks

If you followed the steps in the previous chapters, you are ready to install application programs like AppleWorks on your hard disk and build a menu with your disk management software. I will describe how to install AppleWorks using three different disk management programs: EasyDrive, ProSel, and the Finder.

EasyDrive: It is relatively easy to install AppleWorks with EasyDrive, this program selector automatically sets up the appropriate subdirectories and copies the program files into those directories. Follow these steps:

Figure 6.1: EasyDrive Installation Screen



1. Boot your computer from the hard disk. The EasyDrive Main Menu will appear. Press the Escape Key.
2. Press the Right-Arrow Key to select "Install" and press the Return Key. This action takes you to the installation screen (see *Figure 6.1*).
3. EasyDrive can automatically install the most popular Apple II application programs and a list of those programs appears on the right side of the screen. Use the Arrow Keys to highlight the appropriate version of AppleWorks and press the Right-Arrow Key to make your selection.
4. Press the Escape Key to indicate you have selected the software you want to install and answer "Yes" to indicate that your selection is complete.

5. EasyDrive will prompt you to insert the AppleWorks Start-up Disk and then the Program Disk. Follow the on-screen directions. If you named your floppy disk anything besides /APPLEWORKS, enter the name of that disk when Easy-Drive asks for the pathname.

When EasyDrive finishes, AppleWorks appears in the Easy-Drive menu. To run AppleWorks, highlight "AppleWorks" and press the Return Key. When you quit AppleWorks, the program will return you to the EasyDrive Main Menu.

ProSel: Installing AppleWorks into ProSel is more complex than the automated procedure used by EasyDrive, but is still relatively easy. You must first establish subdirectories on your disk and then copy AppleWorks into that subdirectory. You can use the ProSel utility program Cat.Doctor to set up the subdirectories and copy the necessary files.

Proceed as follows:

1. Boot your computer from the hard disk; the ProSel menu will appear on the screen. Use the Arrow Keys or mouse to select "Cat.Doctor" and press the Return Key.
2. With the Cat.Doctor menu on the screen, type a slash (/) to indicate you want to set up a subdirectory.
3. The name of the active volume on your hard disk appears on the screen. (If you followed the steps in these articles, the name that appears should be /PROGRAMS.) Press the Tab Key to go past the current volume name and enter /AW. The name should now read /PROGRAMS/AW. Press the Return Key.

Now you will use Cat.Doctor to copy all the files from your AppleWorks disk into this subdirectory.

4. Insert your working AppleWorks disk into one of the floppy drives and type an "X" for copy.
5. ProSel asks for the "Source directory". Press the Solid-Apple Key (the Option Key on the IIGS). Enter the slot and drive that contains your AppleWorks disk. If you are using an original AppleWorks disk, the name AppleWorks will appear at the top of the screen. Press the Return Key. If your

AppleWorks files are in a subdirectory, highlight the subdirectory and press the Return Key.

6. ProSel next asks for the destination directory. Enter the pathname of the subdirectory you just created for AppleWorks (e.g., /PROGRAMS/AW), or press the Question Mark Key and select the directory from the map of your disk.

7. ProSel will display a list of the files on the AppleWorks disk. Press Control-A to select all of the files. Then "de-select" the files you do not want to copy by using the Arrow Keys (or mouse) to move the highlight and then pressing the Space Bar to de-select the file. For example, highlight ProDOS by using the Arrow Keys and press the Space Bar to indicate you do not want to copy ProDOS onto the hard disk. (If you use a 3.5-inch copy of AppleWorks, de-select all the sample files on the disk.) Then press the Return Key to copy the files onto the hard disk. If you use a 5.25-inch disk, insert the AppleWorks Program Disk and repeat these steps to copy both the Startup, Program Disks, and Dictionary Disk into the subdirectory /PROGRAMS/AW.

8. Ignore the last prompt from Cat.Doctor; press the Escape Key to return to the Cat.Doctor Menu, then "quit" Cat.Doctor and return to the ProSel Main Menu.

You are now ready to add AppleWorks to the ProSel menu. Continue as follows:

9. Select the ProSel Editor from the ProSel Main Menu and press the Return Key. The top of the screen still displays the Main Menu, but the bottom of the screen will indicate that you are in the Editor. Use the Arrow Keys to highlight a blank area of the screen and press the Return Key.

10. The next screen asks if you want to use the "automatic" feature to add the new application to the menu or if you want to make the entry manually. Answer with "A" for Automatic. (If you do not see this screen, you have an older version of ProSel-8. You should upgrade to the latest version or to ProSel-16.)

11. ProSel displays the name of the current volume. Press the Return Key to view the system files on the volume. Use the Arrow Keys to highlight the file named APLWORKS.SYSTEM and press the Return Key. ProSel adds AppleWorks to the menu. (If you use an UltraMacros-enhanced version of AppleWorks, highlight the file named ULTRA.SYSTEM instead of APLWORKS.SYSTEM.) You can then use the ProSel Editor to change the menu name from APLWORKS.SYSTEM to APPLEWORKS.
12. Press the Escape Key to leave the editor and press the letter "P" to save the new menu.

When you boot your computer from the hard disk, ProSel will display a menu that includes APLWORKS.SYSTEM (or ULTRA.SYSTEM) or a name you entered. Highlight that choice, press the Return Key, and you will be in AppleWorks. Quit AppleWorks and you will return to the ProSel Main Menu.

Installing AppleWorks with the Finder

You can also use the Apple IIGS Finder to install AppleWorks on your hard disk. First, double click on the /PROGRAMS volume on your hard disk. Then, create a new folder by pressing Open-Apple-N or by selecting New Folder from the Files Menu. The Finder automatically names the folder "UNTITLED". Type AW as the new name for the folder and press the Return Key. Next, insert your AppleWorks master disk and double-click on it to open a window.

If you scroll through the AppleWorks disk window, you will see the system file and a number of files with the prefix "SEG". Near the bottom of the list are several sample files and a folder named SAMPLE.FILES. I suggest that you just copy the program files onto the hard disk.

Type an Open-Apple-A to select all the files, then hold down the Shift Key and click the mouse on each of the sample data files you do not want to copy. Also click on the file ProDOS since you do not need another copy of the operating system on your hard disk.

After you select the files you want to copy, put the pointer on any file you will copy, hold the mouse button down and move the files to the new AW folder on your hard disk. The AW folder will darken when the mouse pointer is on the new folder. Release the mouse button and the Finder will copy the files. After the files are copied, drag the AppleWorks disk to the trash can to eject the disk from the drive and store the program disk in a safe place.

Now, it is time to copy your TimeOut modules onto the hard disk and tell AppleWorks how to find those enhancements.

Installing TimeOut

If you use EasyDrive, it's easy to install the TimeOut modules on the hard disk. Insert a copy of the TimeOut disk in a drive, press the Escape Key, and select "Install" from the menu bar at the top of the screen. Follow the same steps you used to install AppleWorks, but select the names of the TimeOut modules you want to install from the menu. EasyDrive will prompt you for the correct floppy disk and will copy the TimeOut files onto the hard disk.

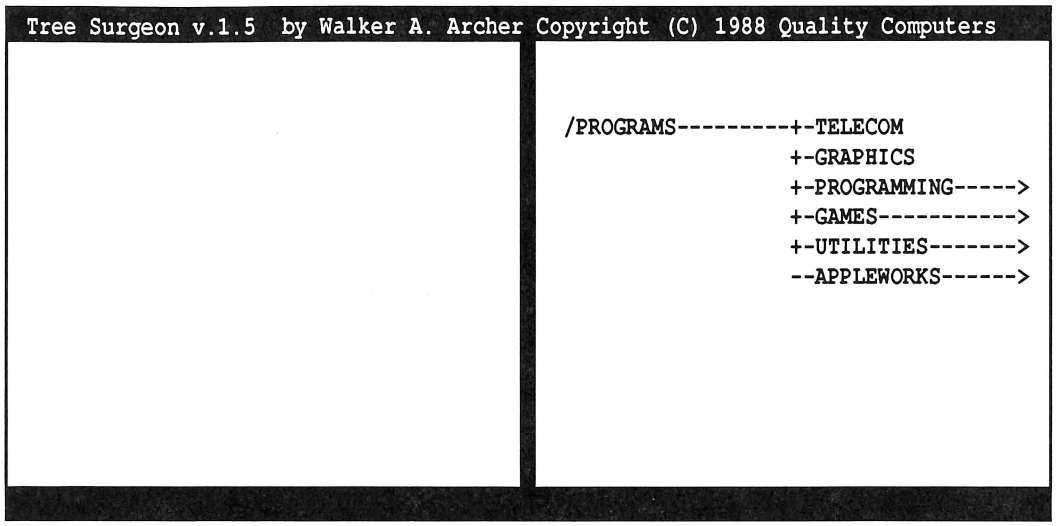
If you use ProSel, use Cat.Doctor to create a separate subdirectory on your hard disk and copy the TimeOut modules into that subdirectory. I suggest you create the TimeOut subdirectory within the AW subdirectory. Call the new subdirectory "TO". If you follow these suggestions, the complete pathname to the TimeOut subdirectory is /PROGRAMS/AW/TO. Then copy all the necessary TimeOut files into that subdirectory using the same procedures you followed when copying AppleWorks. Some modules (e.g., QuickSpell) access other files on the TimeOut disk, so be sure to read the TimeOut manual(s) for a list of the files you should copy from each TimeOut disk.

Re-Install TimeOut on AppleWorks

The next step is to re-configure your TimeOut-enhanced copy of AppleWorks on the hard disk. That is necessary so TimeOut can find the modules you copied into the subdirectory /PROGRAMS/AW/TO. Make certain you have backup copies of both your TimeOut disk and AppleWorks, then follow these steps:

1. Insert a copy of any current TimeOut module in a drive. If you are using EasyDrive, press the Escape Key and then select "Boot" from the EasyDrive menu. Boot the computer from the TimeOut disk. If you are using ProSel, enter the slot number followed by the drive number. For example, press the number "6" then the number "1". Do not press the Return Key or enter any punctuation marks. (Unfortunately, ProSel offers no prompts on the screen nor makes any apparent response to the first key press.) Then select BASIC.SYSTEM, and press the Return Key.
2. With the TimeOut Installer screen on the monitor, select #1, "Continue with TimeOut Installation".
3. The next screen asks if you want automatic or manual installation. Select "Automatic" and press the Return Key. If this screen does not appear, you have an old version of TimeOut and should update to the newest version of the program. You can update directly from Beagle Bros (include $10 and your original TimeOut disk), from a Beagle Buddy associated with any users group, or from one of **NAUG**'s Beagle Buddies. (Contact **NAUG** for more information: (313) 454-1115.)
4. With the TimeOut Automatic Installation Menu on the screen, select choice #2, "Install TimeOut".
5. Respond "Yes" to the "Have you backed up all your disks yet?" prompt.
6. Respond to the "Where is AppleWorks?" prompt with "ProDOS pathname".
7. The Installer will display the default pathname of /APPLEWORKS. Use the Right-Arrow Key to move the cursor to the end of that entry and the Delete Key to delete all except the first slash in /APPLEWORKS.
8. Enter the pathname to your copy of AppleWorks. If you followed the suggestions in the earlier chapters of this book, enter /PROGRAMS/AW and press the Return Key.
9. Press the Return Key again to confirm the pathname.

Figure 6.2: Directory Tree from EasyDrive


Tree Surgeon v.1.5 by Walker A. Archer Copyright (C) 1988 Quality Computers
/PROGRAMS---------+-TELECOM
+-GRAPHICS
+-PROGRAMMING----->
+-GAMES---------->
+-UTILITIES------->
--APPLEWORKS------>
TAB ends selection: '+' adds a sub: '-' deletes a sub: ? selects a new volume

10. TimeOut now expects to copy your TimeOut modules onto your hard drive. You already performed this procedure and there is no gracious way to cancel the procedure. Warm boot your computer by holding down the Open-Apple and Control Keys and pressing and releasing the Reset Key.

Now select AppleWorks from the EasyDrive or ProSel menu and test each TimeOut module. If a module asks you to insert a disk, you must either copy additional files into the TimeOut directory or use the TimeOut Utilities module to configure that application so it finds the necessary files on the hard disk.

Follow these steps to configure an individual TimeOut module:

1. Enter an Apple-Escape to call the TimeOut Menu.
2. Select "Utilities" from the TimeOut Menu.
3. Select "Configure" from the Utilities Menu.
4. Select the module you want to configure. Then examine the location of the necessary files. They should read either "TimeOut Applications Disk" or "/PROGRAMS/AW/ TO". Make the necessary corrections, indicate you want to change the disk copy of the program, and re-check the module.

Installing Other Programs

Now you can install other programs on your hard disk. If you use EasyDrive, use the auto installation program as described above. If your application is not on the EasyDrive list, or if you use ProSel or the Finder, the process is still quite easy.

Installing with EasyDrive: Select Tree Surgeon from the EasyDrive Menu. When Tree Surgeon displays a list of volumes, select the hard disk where you will install your application. The right side of your screen will show a directory tree of your disk (see *Figure 6.2*). You can move through the different subdirectories with the four Arrow Keys. I prefer to keep as few files in my volume directory as possible since the volume directory can only have 51 files. Thus, you might want to create a subdirectory called "APPS" for applications.

Creating a new subdirectory is quite simple. Highlight the directory where you want to create the subdirectory and press the "+" Key. You will then receive a prompt for the directory's name. Enter the pathname for the new subdirectory and press the Return Key. (Try to keep the subdirectory name short; remember, a pathname can only be 64 characters long.)

Put your application disk in one of the drives and press "?" to display the volumes. Select the drive with your application and press the Return Key. Tree Surgeon will display the contents of the volume. Highlight the volume and press the Tab Key. The right side of the screen will display all the files on the volume. You can select all, or some of the files to copy to your hard disk. Press the Right-Arrow Key to select a single file, or press the "=" Key to select all of the files. You can then use the Left-Arrow Key to de-select files such as ProDOS.

After you select the files you want to copy, press the Escape Key. Highlight "Copy" on the menu bar and press the Return Key. Tree Surgeon will prompt you to select the destination volume. Press "?" to display the volumes and select the hard disk. You can then either highlight a subdirectory or add a new one for the destination directory. (To add a new subdirectory, move the cursor to where you want to create the subdirectory and press the "+" Key. Then enter the name of the subdirectory, make certain the subdirectory is highlighted, and press the Return Key.)

Next, you will add the new program to the EasyDrive menu. Exit Tree Surgeon and return to the EasyDrive Main Menu. Press the Escape Key and select "EasyAdd" from the menu bar. The right side of the screen will display a map of your hard disk volume. Highlight the directory with your new application and press the Return Key. The left side of your screen will display the files in the directory; press the Tab Key to jump to that side of the screen, select the first file that ends with ".SYSTEM" and press the Return Key. You can then enter the name you want to appear on the menu. You will see the new menu item when you return to the Main Menu.

Installing with ProSel-8: First, create a new subdirectory with a short, but descriptive name using Cat.Doctor by pressing "/" from the menu and then entering the full pathname. Second, insert your disk containing the program into one of the drives. Enter an "X" to select "Copy" from the menu. ProSel will prompt you for the source disk, press the Solid-Apple Key (or the Option Key on the IIGS) and enter the slot and drive number of the application disk. Cat.Doctor will display and highlight the volume name and displays a map of any subdirectories on that volume. Highlight the volume directory (or a specific subdirectory) and press the Return Key to see the files on the disk. Select all the files by pressing Control-A, then de-select the files you do not need, such as as PRODOS and BASIC.SYSTEM. (To de-select a file, highlight the file and press the Space Bar.) Press the Return Key and Cat.Doctor will ask you for the destination volume. Either type it in or press the Solid-Apple Key and enter the slot and drive. If you used the Solid-Apple Key, you will need to highlight the subdirectory you selected. When Cat.Doctor finishes copying, answer "No" to the last prompt and exit Cat.Doctor.

Finally, you must create a menu item for the application using the steps described earlier. This is relatively easy, once you decide which file starts the application. Look to see if there is a file in the directory that ends with the suffix ".SYSTEM". If there is, select the first .SYSTEM file to launch the application. If there is no .SYSTEM file, select the file named STARTUP. ProSel will automatically run your application when you select it from the Main Menu.

Installing with ProSel-16: Installing new applications with ProSel-16 is similar to the procedures you follow with ProSel-8. From the ProSel-16 menu select UTILITIES and press X for copy. At the source directory prompt, press the "?" Key for a list of volumes. Highlight the volume that contains your application and press the Return Key. Next, highlight the volume name (or a subdirectory) and press the Return Key. (You can also press the "?" Key at the destination directory prompt and then highlight the volume and subdirectory where you want to copy your file.) Finally, you will see a list of all the files on the source volume. Enter a Control-A to select all the files and de-select ProDOS, BASIC.SYSTEM, and other unnecessary files by highlighting the file and pressing the Space Bar. If you are installing a 16 bit application for the IIGS, de-select the System directory. After you select the files you want to copy, press the Return Key to start the copying process.

To add the application to the ProSel menu, select the ProSel-16 editor. Select "A" for automatic and enter the volume name if it is different from the one displayed on the screen. Highlight the System file of your application and press the Return Key. Next, press the Escape Key to leave the editor. At the prompt, press "P" to save the new menu.

If you are installing IIGS applications, you may need to check the subdirectories in the program's System Folder for files that you need on your hard disk. For example, there might be new fonts or CDevs that you will need to copy to your hard disk for the application to function properly. Be sure to check your documentation for specific mention of any files you need to copy.

Summary

You should now know how to install AppleWorks and your AppleWorks enhancements on a hard disk drive. You should be able to generalize these techniques to put all your programs on the hard disk and use the speed and convenience of that powerful system. The next chapter describes how to back up the files on your hard disk and manage the disk.

Chapter Seven

How to Manage Your Hard Disk Drive.

Most popular disk management systems come with important utility programs. In this chapter, you will learn how to use those utilities to manage and improve the performance of your hard disk.

Backup

An old aviation adage says there are two types of pilots; those who have landed with their landing gear up and those who will. Similarly, there are two types of hard disk users; those who have lost data and those who will. Losing access to the data on a floppy disk is upsetting, but losing access to all the files on a 20-megabyte hard disk can test your sanity.

Hard disk users must remember that disk drives are electro-mechanical devices that are susceptible to failure. Although we cannot prevent failures, we can minimize our loss. The first line of protection is a regular backup of all the files stored on the disk.

Backing up a hard disk involves copying the files from the hard disk onto another media, usually onto numerous 3.5-inch floppy disks or onto a magnetic tape. (You can back up your hard disk onto 5.25-inch floppy disks, but that is impractical. It takes approximately 144 5.25-inch floppy disks to store the contents of a 20-megabyte hard disk.) Then, if something happens to the files on the hard disk, you can use the backups to recover your data. Of course, any changes you made in the files since the backup will be lost.

Why Special Backup Software?

You might wonder why you need special software to back up a hard disk. Why not use a disk copy or file copy program you already own?

You cannot use a disk copy program because disk copy programs make exact duplicates of the original disk. That means the original and copy must be on the same media. Thus, you cannot use a disk copy program to back up a hard disk onto floppy disks. You can use a file copy program to make backups of your hard disk, but I do not recommend that procedure. File copy programs do not segment large files that will not fit on a single floppy disk, nor do they keep track of the structure of the subdirectories on your hard drive. Finally, file copy programs are less convenient to use and do not compress your files to save space on the backup disks.

Backup Programs

Like all software, dedicated backup programs differ in the features they offer. However, all share similar traits. They all save your files and keep track of the subdirectory structure of your hard disk. All the backup programs use a "restore" program to reconstruct the data on the hard disk; you cannot simply copy the files from the backup copy onto the hard disk. Since every backup program uses a different approach to storing data, you must use the restore program that came with the backup program should you ever need to recreate the files.

I will describe three of the backup programs available for Apple II systems: Apple Computer's Backup II, and the backup programs that come with EasyDrive and ProSel.

Backup II: Backup II is one of the oldest hard disk backup utilities and has two important advantages. First, the program is free from Apple dealers. Second, Backup II lets you back up the complete hard disk volume, any subdirectory, or only those files that were changed since the last backup.

There are two versions of Backup II. The original version uses a 40 column display (e.g., large letters on the screen) and only works under ProDOS. This version of Backup II will not correctly backup GS/OS files such as AppleWorks GS. The new version uses an 80 column display (same size of letters on the screen as AppleWorks) and will back up both ProDOS and GS/OS files. If you have the original 40 column version of Backup II, see your Apple dealer for the latest release of this program.

EasyDrive: The EasyDrive disk management system includes a backup program you install on the hard disk. EasyDrive's backup program compresses the files so they take up less space on the floppy disk, but EasyDrive does not let you back up a single subdirectory or file; you must back up and restore the complete hard disk volume.

ProSel: ProSel offers the fastest of the backup utilities; if you have two or more 3.5-inch drives, the program alternates between those drives and never stops copying. While ProSel does not offer incremental backups, ProSel does let you restore individual files from your backup disks. ProSel does not offer file compression.

As you can see, each program has its own advantages and disadvantages; any one of these programs will do an adequate job of backing up your files.

Scheduling Your Backups

Backing up a hard disk is not fun. The process usually takes two to three hours and requires that you keep changing disks. But the process is simple and is one of the necessities of owning a hard disk. You should back up your disk on a regular basis. I usually plan full volume backups during the middle of the month because two or three computer magazines arrive about then and I can relax and read while the system does the work. In addition, the arrival of the magazines reminds me that it is time to do the backup.

The frequency with which you back up your hard disk depends on the importance of your files. If you use the disk to run a business, consider backing up your files once or twice each week. If you use your disk primarily for personal work, you should plan at least a monthly backup.

You only need to back up a volume after you make significant changes to the files on that volume. For example, you only need to back up your /PROGRAM volume when you add new software or change configurations. (I only back up my /PROGRAM volume once or twice a year since I have all the original disks.) However, you should back up your /DATA volume on a regular basis. Ask yourself what the effect would be if you lost

all of the data on your hard disk today and if you lost all the data one week after you backed it up. Then, decide on your backup schedule. If you have important data, you might want to keep two sets of disks for your backups. Rotate the sets for each backup so that you have a backup of your backups.

How to Do a Backup

Start the backup process by formatting the required number of floppy or 3.5-inch disks. Name the disks BACKUP.01, BACKUP.02, and so forth; that helps you keep track of which disk you need to insert next. Put a label on each disk.

The speeds of your disk drives might differ slightly and could cause read or write errors if you format a disk in one drive and try to use it in another. Glen Bredon, the author of ProSel, recommends that you format the disk on the same drive you will use when you back up your hard drive. While most backup programs only let you use one floppy drive, ProSel lets you use two drives for the backup process. Therefore, if you have ProSel and two 3.5-inch drives, format the odd numbered disks (e.g., BACKUP.01, BACKUP.03) in Drive 1 and the even numbered disks (e.g, BACKUP.02, BACKUP.04) in Drive 2.

Now it is time to back up your files. If you use Apple's Backup II or EasyDrive, launch the application as you would any other program. Both ProSel-8 and ProSel-16 include backup programs. If you use ProSel-8, select "Utilities Directory" from the ProSel Main Menu, then select "Backup" from the Utilities Menu and follow the on-screen prompts. If you use ProSel-16, press the Escape Key from the Main Menu and select "Backup" from the menu.

Follow the on-screen prompts and insert the appropriate backup disk when requested. When you are done, write the date on a piece of paper and store it with your disks. Store the disks away from your computer to protect your data from theft, fire, or flood. I usually keep my backup disks in a different physical location than the hard disk as added insurance.

Incremental Backups

If you use Backup II or ProSel-16's Backup, consider doing weekly incremental backups. An incremental backup copies only those files that were changed since the last backup; incremental backups are relatively fast and convenient. If you use EasyDrive or ProSel-8, consider backing up your AppleWorks data files as you work by copying them to another disk. Keep them on the desktop until the end of the day and save them on floppy disks before quitting AppleWorks. I suggest you maintain separate floppy disks for each subdirectory on your hard disk (e.g., one disk for personal letters, one disk for tax data, and so forth.)

At the end of the day, go to the Other Activities Menu and tell AppleWorks you want to save your files on the floppy disk drive instead of the hard disk. Then bring the file onto the screen, insert the correct disk in the drive, and issue an Apple-S command to save the file. Reformat these disks after you do a regular backup.

Another alternative for backing up your hard disk is to purchase a second hard disk or a hard disk with a removable cartridge. The decreasing cost of these drives makes them a viable alternative backup medium. If you purchase a second hard disk, you can use a file copy program to make your backups. Using a copy program provides a set of files that are identical to the originals. You can use these files immediately if the primary hard disk fails. Backup programs shrink and otherwise modify files; you need to use the accompanying restore program to use the files.(Note: AppleWorks users who own TimeOut UltraMacros and TimeOut FileMaster can write macros that automate this copying process.)

Apple's new High-Speed SCSI card also offers a third alternative, the capability of using tape drives for backup. However, tape cartridge backups are not a recommended option for most users. Tape systems are as expensive as an additional hard disk and do not offer the flexibility that is available from a two disk drive system.

Optimization

Most hard disk management programs include an optimizer, a utility that improves the performance of the disk by rearranging the data on the disk platter. It works as follows:

ProDOS (and GS/OS) saves your files in "blocks"; each block holds 512 bytes of data. When your disk drive is empty, the operating system saves files in blocks that are adjacent to one another. Storing the data in adjacent blocks minimizes the distance the drive head needs to move to save or load a file.

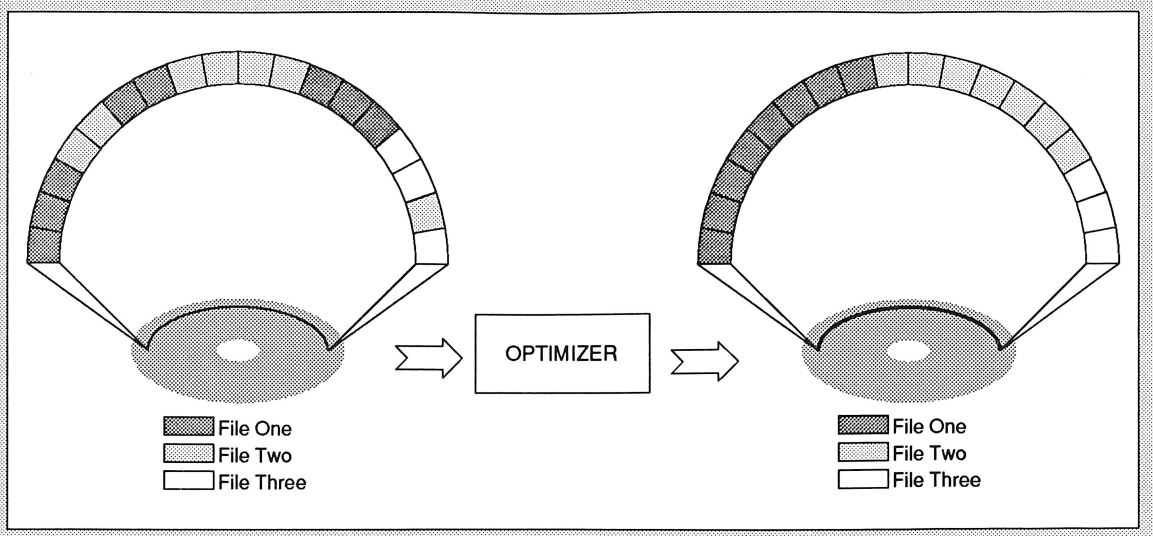
Now imagine a hard disk with File 1 stored in blocks 50-65, File 2 in blocks 66-88, File 3 in blocks 89-92, and File 4 in blocks 93-110. When you delete File 3, you leave blocks 89-92 empty. The next time you save a file, ProDOS will start to save the file in blocks 89-92. If the file fits, ProDOS stores the file in adjacent blocks on the disk. If the file does not fit, ProDOS stores the beginning of the file in blocks 89-92 and then looks for free space elsewhere on the disk. Thus, as you use a disk drive, your new files get separated, or "fragmented". This fragmentation slows down the operation of the drive because the heads must move from location to location while they read and write the different segments of the file.

Most optimizers move all the subdirectories to the beginning of the disk; that makes it easier for ProDOS to read the directories and find the files. In addition, the optimizer moves each file into contiguous blocks to speed up the hard disk loading and saving times. You can get up to a 50% increase in speed when you optimize a badly fragmented disk; thus the ability to optimize a disk is an important part of a hard disk management package.

Figure 7.1 depicts the position of files on a disk track both before and after optimization.

Consider this word of caution about optimizers. Moving blocks of data around a disk is a risky process. If anything goes wrong, you might be unable to access some or all of the files on the disk. Therefore, you should only run an optimizer program after doing a complete backup of all the volumes on the disk. Then, if a problem develops, you can use the backup to recover your files.

Figure 7.1: Disk Optimization



Both EasyDrive and ProSel come with optimizing programs that rearrange the data on a disk so it is easier to access. EasyDrive's program is called "Optimizer"; ProSel's optimizer is cryptically named "Beach Comber". If you have a IIGS, you will want to use Beach Comber 32 from the ProSel-16 disk; it is the only version of Beach Comber that can handle GS/OS forked files.

Comparison of Optimizer and Beach Comber

EasyDrive's Optimizer is slower but safer than Beach Comber. Optimizer never reads more than two blocks into memory at a time, thus you are unlikely to lose more than a single file if the power fails or disaster strikes. ProSel's Beach Comber uses the memory in your computer to read in larger segments from the disk. As a result, Beach Comber is significantly faster than Optimizer. But if the power fails, you are likely to suffer greater damage to the files on your disk if you use Beach Comber.

Optimizer has another advantage; it lets you press the Escape Key and quit the program at any time. That's a useful feature because it can take three to five hours to optimize a 20-megabyte hard drive. You cannot quit Beach Comber until it completes its task, but that is less of a problem because Beach Comber takes less than an hour to optimize the same 20-megabyte drive.

EasyDrive's Optimizer lets you optimize only the subdirectories; that is significantly faster than optimizing the complete drive. (Optimizing the subdirectories gives you almost 90% of the speed increase you obtain from optimizing the entire hard drive.) EasyDrive also includes a utility called "Status" that checks the number of fragmented files on your disk and recommends whether or not you should optimize the disk.

Clean Up Your Drive

One theorem of home ownership is that one's possessions always grow to exceed one's storage capacity. A corollary is that one's need for data storage always exceeds the available space for one's files. It is difficult to imagine filling up a hard disk but, unless you are careful, you will.

Even before you fill your disk, there are good reasons to delete older files and conserve space on the system. First, consider the extra time it takes to scroll through older files when you look at the disk directory. Those files also slow down the computer because ProDOS must read and display the filename each time you read a directory. Second, the more files on your drive, the longer it takes to back up and optimize the drive. Anything that discourages you from backing up and optimizing your hard disk should be avoided; these are important operations.

Every few months you should search through the data files on your disk and "archive" the unused files by copying them onto one or more floppy disks. Then delete the files from the hard disk. You can use TimeOut FileMaster for this process. FileMaster works within AppleWorks (so you can look at the contents of each file) and FileMaster can show you the disk catalog sorted in chronological order. (To sort a directory in FileMaster, select "List Files" from the File Activities Menu and issue an Apple-A command. FileMaster will ask if you want to sort the directory alphabetically by name, chronologically, by size, or by date.)

Parking the Heads

As I described earlier, hard disk drives work by having lightweight read/write heads "float" over spinning disks on a cushion of air. These systems are surprisingly rugged when you

consider how delicate the mechanism must be inside the unit. But the drives are susceptible to damage when you move the units; it's important to "park" the heads in a position where they cannot damage the data on the disk.

While many hard disk systems automatically park their heads, other drives rely on a utility program to manually execute this process. If your drive does not have self-parking heads, make certain you run the head-parking software that comes with the drive whenever you shut down the unit. ProSel-8 and ProSel-16 also include a utility called Park Heads. If you use ProSel-8, select "Utilities Directory" from the ProSel Main Menu, then select "Park Heads" from the Utilities Menu. If you use ProSel-16, select the Utilities Folder under "Miscellaneous" (not "Utilities" under "ProSel-16 stuff"), then select "Park Heads" from the Utilities Menu.

Updating ProDOS and GS/OS

There are two things I especially like about my Apple II computers. First, Apple continues to improve and introduce new operating systems for the Apple II line. Each new version of the operating system stretches the capabilities of the machine and the user. Second, the upgrades are free from your local dealer or users group. Of course, you will have to pay for the documentation, but the system software is free. However, what do you do when you receive the system software? The following paragraphs will explain how to update the operating system on your hard disk.

Updating ProDOS: Updating your hard disk to a new version of ProDOS is simple. Follow these steps:

1. Make a good copy of the current ProDOS and BASIC.SYSTEM files (they are in the main volume directory of your hard disk) on a floppy disk. You need these backups for two reasons: First, if your copy of the new files is corrupted or damaged, you can always revert back to the older version. Second, you might find an incompatibility or bug in the new version of the program. Having the original lets you revert back to the older version.

2. Use Tree Surgeon, Cat.Doctor, the Finder, or the System Utilities disk to unlock the ProDOS and BASIC.SYSTEM files on your hard disk. You can tell if a file is locked by looking for an asterisk next to the file name when you catalog the disk.
3. Copy the new versions of the two files from the floppy disks onto your hard disk.
4. Reboot the computer and you will be operating under the updated system. You can tell which version of the ProDOS operating system you are using by watching the startup screen. The ProDOS version number is always displayed during the bootup process.

Updating ProDOS to GS/OS: If you decide to switch to GS/OS from ProDOS on your Apple IIGS, you will need to install the new operating system from scratch. The process is simple, but you will need to use the Installer program included on the System.Tools disk. First, back up your hard disk. Then follow the instructions in Chapter 4 to install the new system. Do not use a file copy program to copy the files from the floppy disk to the hard disk.

Updating GS/OS: Updating the GS/OS system is similar to the initial installation described in Chapter 4. You will need to boot from the new 3.5-inch system disk and then select the Installer from the System.Tools disk. If you are using EasyDrive or ProSel-16, you will want to install the latest system files without the Finder. After you finish the installation, you can use the Finder to copy the START file in the System Folder on the floppy disk to some other directory on your hard disk. Rename the START file to "Finder". You can then access the Finder from EasyDrive or ProSel. If you are using the Finder on your hard disk, select the option to install the latest system files with the Finder.

Problems

Now that you've taken all the necessary precautions, what do you do if your hard disk fails? First, power down your system, check the cables, and remove and re-seat the hard disk interface card in the computer. Many hard disk problems can be traced to poor connections between the cables, card, and computer.

If that doesn't help, call the technical support staff at the dealer where you purchased the drive. Dealers who sell many hard drives are aware of the usual problems with the systems they sell; a good dealer will try to help you get the system going. If that doesn't help, call the technical support staff at the manufacturer.

If the disk drive is working but you lost access to your data, you can reformat the disk and restore the data to the volume using the backup disks. But first speak to the dealer and manufacturer; an experienced hand might be able to recover the old files and have you avoid reformatting the disk.

Some manufacturers will attempt to recover your data when they repair a drive. When your disk is returned after a repair, check it first before reformatting or restoring the files. You might find that your data is still intact. One manufacturer repaired my drive and recovered my data. Unfortunately, they shipped my drive to another user who formatted the disk with a Macintosh!

Always be alert to any unusual sounds from your disk drive. If you hear anything unusual or you experience problems when booting, immediately do a backup and then check with the appropriate technical support group. Hard drives often give plenty of warning before they fail completely.

Summary

By now, you undoubtedly appreciate the speed and convenience of your hard disk. Regular and frequent backups and proper management of the disk are necessary for a safe and efficient work environment.

Chapter Eight

How to Install 16-bit Programs on a Hard Disk Drive.

Installing new 8-bit programs like AppleWorks on a hard disk drive connected to an Apple IIe, IIc, or Laser 128 computer is simple. All you do is copy the files from the floppy disk onto the correct subdirectory on the hard disk. However, copying 16-bit programs on an Apple IIGS running under GS/OS is a more complex operation.

In this chapter, I will describe two ways to install programs that run under GS/OS on an Apple IIGS hard disk.

Why GS/OS is Different

If you catalog a ProDOS disk such as AppleWorks, you will find that most program files are of two types: "SYS" or system files and "BIN" or binary files. These two file types contain the program code the developer wrote to make the application run. System and binary files are easily copied with programs such as the Finder, Tree Surgeon, Cat.Doctor, Copy II+, and the System Utilities. In addition, when you catalog the master disk, you see a list of all of the subdirectories and files on the disk.

Programs developed exclusively for the Apple IIGS have a different file structure from those developed for the 8-bit Apple IIe or IIc. For example, if you catalog your AppleWorks GS Program Disk, you will notice that it lists a program file that is an "S16" or a 16-bit system file. Some of these files are actually extended or "forked" files. "Forked" files have two main components: a "data fork" and a "resource fork". The data fork of the file contains the actual program. The resource fork can include information about how to draw the windows and buttons on the screen and other information the program needs to run. 8-bit copying programs such as Copy II+, FileMaster, Tree Surgeon, or Cat.Doctor only copy the data forks and not the resource forks. Thus, you cannot use these programs to copy 16-

bit program files such as those in AppleWorks GS or in the GS/OS operating system itself.

Copying GS/OS Files

The only way to copy GS/OS files is to use the Finder, ProSel-16, or another GS/OS copy program that recognizes forked files. Copying files with the Finder is easy. Simply click on a file or folder you want to copy and hold down the mouse button. Then drag the file or folder to the new disk or folder and release the button. The Finder will display a message and thermometer as it copies the file.

You can also copy multiple files and folders with the Finder. To select the files, hold down the Shift Key and click once on each file or folder you want to copy. Once they are highlighted, move the mouse pointer to one of the highlighted files, press the mouse button down and hold it down. Now you can drag all the selected files to the new folder or disk.

Installing 16-bit Programs

There are two popular ways to install new 16-bit programs on a hard disk running under GS/OS. You can use either the Apple IIGS Installer included with most GS/OS-compatible programs, or you can install the program with ProSel-16. (If you have an older Apple IIc-compatible 3.5-inch Unidisk drive, you will have to use ProSel-16; a bug in GS/OS will not let you use the Installer to copy the programs from a Unidisk onto the hard disk. If you do not have a Unidisk, I recommend that you use Apple Computer's Installer program to copy the files from the 3.5-inch disk onto the hard disk.)

I will describe how to use both the Installer and ProSel-16 to install AppleWorks GS. By the time you complete this chapter, you should have a better understanding of the GS/OS installation process and should be able to generalize these techniques to all other 16-bit programs.

Using the Installer

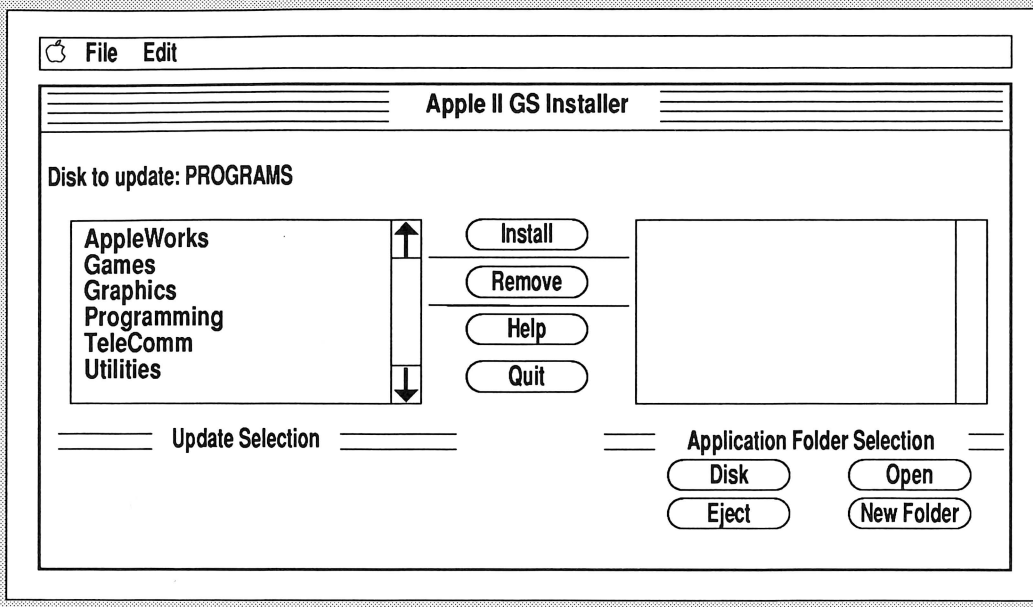
The SCSI driver in GS/OS 5.02 has a bug which causes problems when copying large files. If you are using GS/OS version 5.02, you must disable that driver. Follow these steps to use the Finder to disable the driver:

1. With the Finder on the screen, open the System folder on the first volume of the hard disk (the one with your programs) and then open the folder named Drivers.
2. Click once on the file "SCSIHD.Driver" to highlight the file.
3. Select "ICON INFO" from the Special Menu on the menu bar.
4. Click on the "Inactive" button on the file card to disable the driver.
5. Reboot the computer to disable the driver. While rebooting, GS/OS will display a dialog box reminding you that you need a SCSI driver. Press the Return Key when you see the message.
6. After you finish installing AppleWorks GS or another application, follow the steps above and click on the "Inactive" button to reactivate the SCSIHD.Driver (the "X" in the box will disappear). Then reboot your computer to activate the driver.

Now you are ready to use the Installer. Follow these steps:

1. Insert the AWGS.Utilities disk and double click on the Installer icon. You will see two windows, one containing the installation options, and one with the first volume of your hard disk (see *Figure 8.1*).
2. Click on the AppleWorks GS dictionaries in the window and then click on "Update Selection". The Installer will display a catalog of your hard disk.
3. Click on the New Folder button and create a folder called "AWGS".
4. Click on the AWGS folder in the "Application Folder Selection" window to select this folder as the location for your dictionaries.

Figure 8.1: AppleWorks GS Installer



5. Hold down the Open-Apple Key and highlight the "AppleWorks GS–Hard Drive" choice in the Update Selection window. The volume directory in the right hand window will disappear.

6. Click on "Install" to copy the files.

The Installer will copy the ImageWriter, modem, and printer drivers to your hard disk, as well as the Geneva, Monaco, and New York fonts. It will also copy the AppleWorks GS program, the ImageWriter page setup, and the printer setup files to your disk. When the Installer is done, click on "Quit". You should now find the AppleWorks GS program file in the volume directory and the dictionaries in a folder called Dictionaries in the AWGS folder you created. You should now use the Finder to move the AppleWorks GS program into the AWGS folder.

Installing AppleWorks GS with ProSel-16

The following steps describe how to install AppleWorks GS with ProSel-16.

If you are using GS/OS 5.02, you must disable the SCSI Driver. Proceed as follows:

1. With the ProSel Utilities Menu on the screen, press the Tab Key to display the next menu.
2. Select "Disable Files" from the menu and enter the pathname to the driver, e.g., "/PROGRAM/SYSTEM/DRIVERS".
3. Highlight "SCSIHD.Driver" and press the Space Bar.
4. Press the Return Key and then reboot.

Now you are ready to copy the necessary program files onto the hard disk. The next step is to determine which files to copy. This is not as easy as it sounds because program developers expect you to use Apple's Installer and their installation scripts. As a result, they usually do not list the files you must copy to the hard disk. However, you can use ProSel-16 to study the installation script so you can determine which files to copy.

Follow these steps to use ProSel-16 to examine the installation script for AppleWorks GS:

1. With ProSel's Main Menu on the screen, insert the AWGS.Utilities disk and select "Utilities" from the ProSel menu.
2. ProSel asks for the directory you want to examine. Type "/AWGS.Utilities/Scripts" and press the Return Key.
3. Highlight the file named "AWGS" and press the Space Bar.
4. Press the Return Key and indicate whether you want to view the contents of the file on the screen or send the file to the printer.

Study the output and you will see that the first files in the Installer Script are on the AWGS.System disk. Follow these steps to determine which files you already installed on your hard disk drive and to copy the remaining files:

1. With the ProSel-16 Utilities Menu on the screen, select the Catalog option.
2. Enter the pathname to the Drivers directory on the first volume of your hard disk (e.g., /PROGRAMS/SYSTEM/DRIVERS) and press the Return Key.

3. Check to determine which files on the AWGS.Utilities disk are missing from your hard disk.
4. Copy the files you are missing by selecting the Copy option from the ProSel-16 menu.
5. Insert the AppleWorks GS System disk. The source directory is /AWGS.SYSTEM/SYSTEM/DRIVERS and the destination will be the DRIVERS directory on your hard disk (e.g., /PROGRAMS/SYSTEM/DRIVERS).
6. Highlight each file you want to copy and press the Space Bar. After you select all the files, press the Return Key.

The next step is to check if your hard disk has the necessary fonts.

1. Select the Catalog function from the ProSel menu and enter the pathname for the fonts on your hard disk (e.g., /PROGRAM/SYSTEM/FONTS).
2. Compare your list of fonts to those in the Installer script. You will need to copy any fonts in the Installer script that are missing from your hard disk.
3. Select the Copy option from the ProSel Utilities Menu and copy those fonts. The source directory is /AWGS.System/SYSTEM/FONTS and the destination directory is the path to the FONTS subdirectory on the hard disk (e.g., /PROGRAMS/SYSTEM/FONTS).

The next step is to copy the AppleWorks GS Icons to the Icon subdirectory on your hard disk. The source directory is /AWGS.SYSTEM/ICONS and the destination directory is the Icon subdirectory on your hard disk (/PROGRAMS/ICONS). Highlight and select "AW.Icons" and "AWGS.Icons" to copy those files onto your hard disk.

Next you will copy the AppleWorks GS dictionaries. First, use the ProSel utilities to create a subdirectory on your hard disk. Second, use the ProSel utilities to copy the dictionary files from the Utilities disk to the hard disk. The source directory is /AWGS.Utilities and the destination directory will be the path to your AppleWorks GS subdirectory (e.g., /PROGRAM/AWGS). To copy the files, highlight the Dictionaries subdirecto-

ry on the AWGS.Utilities disk and press the Space Bar to select it. When you press the Return Key, ProSel will create a new Dictionaries subdirectory on your hard disk and copy all the files into the subdirectory.

Now you will copy the AppleWorks GS program. Insert the AppleWorks GS Program disk and select Copy files from the ProSel menu. Enter /AWGS.PROGRAM for the source directory. The destination directory is the path to the AWGS subdirectory (e.g., /PROGRAMS/AWGS). Select all the files by pressing Control-A and then press the Return Key. ProSel will copy all the files to your hard disk.

You have now copied all the necessary system files, fonts, and program files onto your hard disk system. If you are using GS/OS 5.02 you must now re-enable the SCSI driver you deactivated earlier. If you are using a later version of GS/OS, you can skip this step.

Follow these steps to enable the SCSI driver under GS/OS 5.02:

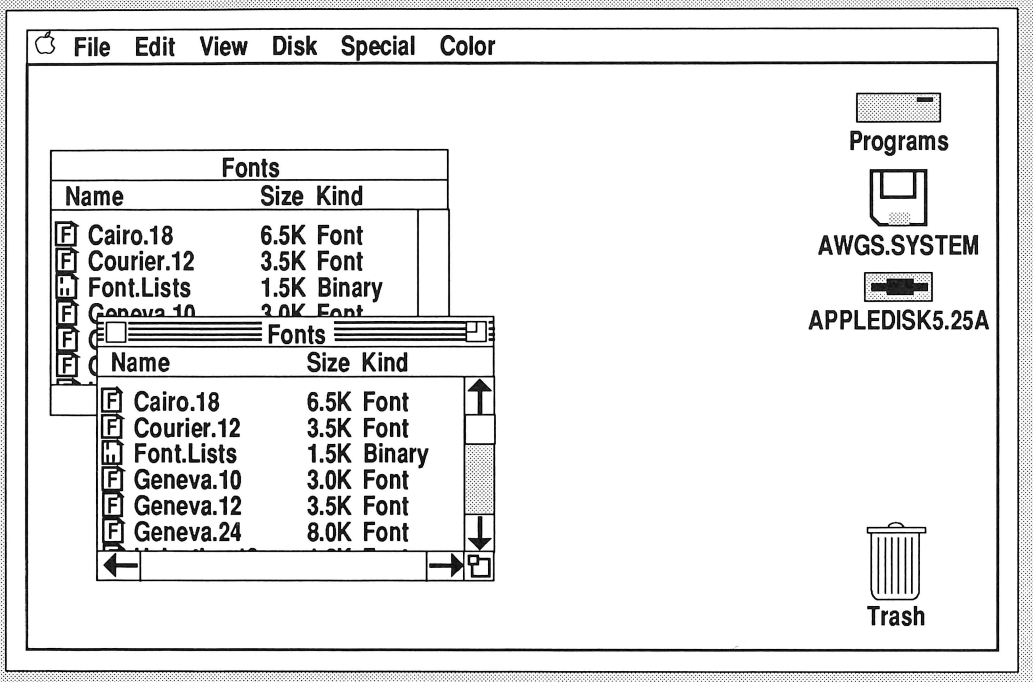
1. With ProSel Utilities Menu on the screen, press the Tab Key to display the next menu.
2. Select "Enable Files" from the menu and enter the pathname to the driver (e.g., /PROGRAM/SYSTEM/DRIVERS).
3. Highlight SCSIHD.Driver and press the Space Bar.
4. Press the Return Key and then reboot.

Installing Other Applications

You may find some GS/OS programs that do not include Installer scripts, so you must install these applications with either ProSel-16, the Finder, or another GS/OS copy program. One problem you will encounter is determining which files on the application's System Disk should be copied onto the System folder on your hard disk. I suggest that you use the Finder to compare the files in the program's System folder with those in the System folder of the hard disk. Follow these steps:

1. With the Finder desktop on the screen, double click on the System folder for your hard disk.

Figure 8.2: Fonts Installer Screen



2. Double click on one of the folders in the System folder (e.g., Fonts) to display the installed fonts.
3. Move the Fonts window to the top of your desktop.
4. Select View from the menu bar and highlight "by Name".
5. Insert the System disk for the application and open the disk by double clicking on it.
6. Open up the same folder in the floppy disk's System folder (e.g., Fonts).
7. Move this window to the lower part of the screen and display the fonts "by name" (see *Figure 8.2*).

You can now scroll through the two windows and compare the files. When you find a file in the floppy window that does not exist on your hard disk and that you think you need, drag it to the open folder on your hard disk to copy it. However, be selective in this process. For example, if you do not have a MIDI interface, you do not need the MIDI driver. You might also want to check the dates of the files to make sure you have the most recent versions.

Summary

The easiest way to install GS/OS applications is with the Installer and scripts provided on your application disks. Do not use ProDOS copy programs like Copy II+, TimeOut FileMaster, or the copying programs included with EasyDrive 1.x or ProSel-8 to copy GS/OS files or to install 16-bit programs. The ProDOS programs do not properly copy the resource forks of those files.

In this chapter, I described how to use the Installer and ProSel-16 to copy 16-bit Applications like AppleWorks GS onto your hard disk.

Chapter Nine

Solutions to Hard Disk Drive Problems.

The previous chapters in this book describe how to install, organize, and use a hard disk drive. In this chapter, I will describe how to handle problems that can occur when you use your drive. I will discuss how to identify and isolate bad sections of a hard disk, and how to locate "lost" files on the disk, how to re-partition a drive, and how to copy GS/OS files. I will also suggest techniques that let you identify the cause of a problem and how to recover your data when a drive fails.

Bad Blocks

Occasionally, a drive will develop bad blocks; blocks that the drive cannot read. No one is certain what causes a bad block; it may be caused by excessive heat in the drive or simply the aging process.

Fortunately, both the Chinook SCSI Utilities and ProSel's Mr. Fixit can identify and eliminate bad blocks. These programs can search the disk for bad blocks and "lock out" a defective portion of the disk so ProDOS does not use that segment of the disk platter. You should use one of these utilities to check your hard disk for bad blocks after it is formatted and each time you experience a problem.

How to Find Lost Files

As you use your hard disk, you will store more and more files and subdirectories on the disk. Eventually it will become difficult to remember where you stored each file. In addition, you will occasionally save a file in the wrong subdirectory. Searching for "lost" files is both time consuming and frustrating. Fortunately, EasyDrive, ProSel, and TimeOut DirecTree and File Search (both on the DeskTools II disk) can help you find those files.

EasyDrive's search program, called "Seek", is part of the Tree Surgeon utility. To use Seek, launch Tree Surgeon, select the directory you want to search and press the Return Key. Then press the Escape Key and highlight Seek on the menu bar at the top of the screen. Seek will ask for the filename you want to locate and, if it finds the file, will display the complete pathname to the file at the bottom of the screen.

ProSel's Find File is more powerful; it not only searches for filenames but also searches for a string of characters in the data files themselves. Find File lets you limit your search to any directory you specify; the program does not waste time looking through a directory that you are sure does not contain the file. You can also limit the file to specific filetypes. For example, you can limit a search to AppleWorks word processor documents.

DirecTree is a TimeOut module that lets you search a hard disk from within AppleWorks. You access DirecTree by typing an Apple-Escape with AppleWorks on the screen. After selecting DirecTree from the TimeOut Menu, the program offers you a menu-driven route to specify the file you want to locate. DirecTree then searches the active drive and lists all filenames that contain the characters you specified in your search. When you highlight a file name, DirecTree displays the complete pathname to that file. If the file is in AppleWorks format, you can highlight the filename and press the Return Key; DirecTree will load the file onto the AppleWorks desktop.

TimeOut File Search lets you search for AppleWorks files that contain any string of text characters you specify. The combination of DirecTree and File Search give you the power of ProSel's Find File within AppleWorks.

Re-Partitioning Your Hard Disk

After you use your hard disk for a while, you might decide to change the size of the partitions. Unfortunately, that is not as easy as it sounds; changing the partitions requires that you delete all the files, re-partition the drive, and restore all the deleted files. Furthermore, most backup programs will only restore files to a volume that has the same capacity as the orig-

inal. Thus, you will not be able to use those programs to copy your files onto the newly partitioned volumes.

Fortunately, the ProSel documentation includes directions that describe how to modify ProSel's restore program so it can copy files onto a larger volume. Then you can use ProSel to restore your files onto a larger partition.

Unfortunately, none of the backup programs let you restore disk files onto a smaller partition. However, there is a workaround. The trick is to first restore the files onto a larger partition, then use a file copy program to copy the files onto the smaller volume. Then you can delete the files from the larger volume and restore another set of files onto that partition.

The lesson is that if you are considering partitioning your hard disk into different size volumes, you must plan ahead and insure that you have a strategy that will restore your data.

Copying GS/OS Files

Copying ProDOS files between disks and volumes is easy; you can use any file copy program to transfer the data. However, GS/OS supports a more complex "extended" file structure that allows files with "resource forks" and "data forks". Unfortunately, none of the ProDOS copying programs (including Copy II+, TimeOut FileMaster, and the copying programs included with EasyDrive and ProSel-8) can copy files with these extended formats. Worse yet, these programs do not warn you when they make an incomplete copy of a GS/OS file; instead, they leave you with the impression that you have an acceptable copy.

The only safe way to copy a GS/OS file is with the Finder or with the copy program in ProSel-16, since these GS/OS-compatible copy programs are designed to handle files with this extended format. In addition, you should always use the install option to install the GS/OS system or application programs like AppleWorks GS. If you forget and copy a GS/OS file with a ProDOS copy program, make certain you use a GS/OS-compatible utility to delete the file from your destination disk before attempting to copy it again.

When Trouble Strikes

Believing that you will never have any problems with your hard disk is like saying you will never have a flat tire. I actually believe both, but have had more hard disk failures than flat tires! There are two ways to deal with a troubled hard disk. One approach is preventative, the other is after the fact.

Prevention: The most practical way to prevent hard disk disasters is to make regular backups of the files on the disk. Having the most recent copies of your files on a floppy disk changes a nightmare into an opportunity to catch up on your reading while you format and restore the drive.

A second preventive measure is to insure that the air flow is unrestricted around the drive. A cool operating environment will reduce the likelihood that you will experience hardware problems with the drive system.

Third, avoid moving the drive, particularly when it is operating. Avoid banging your chair into the desk, dropping books on the desk, and or any other motion that vibrates the drive. And try to expand your knowledge of the ProDOS and/or GS/OS operating systems. You will be surprised at how helpful a little understanding can be if you experience a problem.

After the Fact: All is not lost when you experience a hard disk failure. After you regain your composure, set about trying to determine the exact nature of the problem. Remember that if the problem is software related, you can probably repair the system yourself.

Start by booting ProSel, Copy II+, or the System Utilities from a floppy disk and try to catalog the hard disk. If you can access your disk catalog, you know there is hope.

If you have a catalog display, use the program to copy your most valuable files onto a floppy disk. Then make a full backup of the hard disk. It is important to make a backup immediately in case the problem indicates a more serious hardware failure.

After completing the backup, check the boot blocks of the disk by trying to read blocks 1 and 2 with ProSel's BlockWarden utility. If you receive an error message during one of the reads, the boot blocks are bad. You can use BlockWarden to copy new

boot blocks from another disk. If you are using ProDOS, make certain that you copy blocks 1 and 2 from any bootable ProDOS disk (e.g., the AppleWorks Startup Disk). If you are using GS/OS, copy those blocks from a GS/OS disk (e.g., the AppleWorks GS disk). The ProSel documentation includes the instructions you need to copy those blocks.

If the boot blocks appear to be correct, do a "low level format" of the disk. You can use the software that came with your hard disk, the Apple SCSI Utilities, or Chinook's SCSI Utility to perform this operation. Note that a low level format is different than formatting a disk with Copy II+, Cat.Doctor, EasyDrive, or Finder; don't use those utilities to format the disk. Then restore the files onto the disk. Hopefully, this will solve your problem.

If you can catalog your disk but the catalog is scrambled, you have a software problem. Generally, this is caused by a program that inadvertently writes data on the volume directory. Before formatting and restoring the files on the disk, try to repair the damage with ProSel's Mr. Fixit. Run Mr.Fixit in Test Mode. If the program detects the problem, run the Fix Mode to try to repair the damage. If Mr. Fixit cannot repair the damage, your only recourse may be to do a low level format and restore the disk with your most recent backup.

If you are unable to access your disk, you may have a hardware problem. First, turn your computer off and insure that the interface card is well seated and all the cables are properly connected. If the computer still will not boot, try a different SCSI card in case your card is damaged. If you still cannot boot the drive, it is time to call your dealer or the manufacturer's technical support number.

The technician will probably want to know the purchase date, model, size of your drive, and what card you have in each slot. Write down what your drive did when you tried to boot and the steps you've taken thus far. If you need to return your disk, the support person will provide a return authorization number and tell you where to write it on the packaging. Be sure to follow their instructions to avoid delays.

Viruses

Most Apple II users have been spared from the wrath created by computer viruses on Macintosh and IBM computers, but there are known viruses that can infect and damage Apple II disks. Viruses typically come attached to files unknowingly passed to you by friends or downloaded from bulletin boards. If you only use your disks on your own computer, your system will probably never be infected. However, if you use programs downloaded from electronic bulletin boards or software from a friend, your system is susceptible to infection. There are a few virus detection programs available on Compuserve, GENIE, and America Online that can find and eradicate viruses. The files on all the major online services, as well as those available from **NAUG**'s electronic bulletin board and **NAUG**'s Public Domain Library, are carefully checked for viruses and are generally safe.

Other Utilities

Once you begin using your hard disk, you might find a need for additional utility programs. The national online services such as Compuserve, GENIE, and America Online all maintain collections of utilities you can download and use on your hard disk. Of particular interest are those for SCSI drives that do low level formatting. You might want to visit one or more of these services and build a collection of these utilities.

Summary

Although you may encounter an occasional technical problem, you will undoubtedly appreciate the speed and convenience that a hard disk system adds to your Apple II computer. This chapter described how to protect yourself from these occasional problems and restore your system when you experience difficulty.

About the Author

Gary R. Morrison is an associate professor at Memphis State University where he teaches courses in instructional design and technology, including a course in the design of computer-based instruction. He has published over 50 papers on instructional design and computer-based instruction. Before joining Memphis State University, he worked as an instructional designer for Tenneco Oil Company, General Electric Company's Corporate Consulting Group, Solar Turbines International, and the University of Mid-America. Dr. Morrison is also the co-author of *Beginning with ProDOS 8 & 16* published by Quality Computers. He has written a number of instructional software packages to accompany college textbooks and a computer-managed instruction system for self-paced courses. He has also produced over 20 hours of instructional television programs. Dr. Morrison is the author of RepairWorks, published by QLabs, which recovers damaged AppleWorks files. His latest projects include a course on C programming with Walker Archer which is offered online on GENIE.

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About NAUG

The National AppleWorks Users Group (**NAUG**) has one mission – to help AppleWorks users.

Formed in 1986, the National AppleWorks Users Group (**NAUG**) is the world's largest association of Apple II users. By early 1990, **NAUG** had grown to more than 15,000 members in the United States and 44 other countries.

Benefits

NAUG members receive the ***AppleWorks Forum***, a 36-page monthly newsletter that describes tips, techniques, and hints to help users get more from AppleWorks. The ***AppleWorks Forum*** includes articles of interest to AppleWorks users, including news of product releases and reviews of AppleWorks enhancements and AppleWorks-compatible software. **NAUG** works closely with Claris Corporation, Apple Computer, Applied Engineering, Beagle Bros, Checkmate Technology, JEM Software, and other AppleWorks developers to insure that members get the latest information about AppleWorks.

NAUG members have access to more than 150 volunteer-consultants who provide free telephone support for their fellow **NAUG** members. A list of consultants and their areas of expertise appears in each issue of the ***AppleWorks Forum***.

Members get unlimited access to **NAUG**'s AppleWorks electronic bulletin board, the Electronic Forum. The Electronic Forum lets you get answers to questions and download AppleWorks templates and programs 24-hours a day. As of this date, the Electronic Forum has received more than 38,000 calls from **NAUG** members seeking help or sharing information with their **NAUG** colleagues.

Members have access to **NAUG**'s Public Domain Library that contains hundreds of AppleWorks templates and files. The library also contains AppleWorks enhancement programs and utilities submitted by members and commercial vendors.

NAUG members have access to the group's Disk Rescuers Program; professionals who can recover damaged AppleWorks data disks. You will appreciate this program if you ever forget to back up an important file and get the dreaded "Unable to read disk in Drive 2" message.

Finally, **NAUG** members receive significant discounts on AppleWorks products. For example, members can purchase TimeOut enhancements, RepairWorks, SuperPatch, and other AppleWorks-compatible programs at 40% off the suggested retail price. Members also get significant discounts for **NAUG**'s AppleWorks seminars.

NAUG membership costs $29 per year and includes 12 issues of the ***AppleWorks Forum***. Send a check or your Visa/MasterCard number and expiration date to:

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The Apple II Hard Disk Primer

About the Book:

The ***Apple II Hard Disk Primer*** tells you everything you need to know to use a hard disk with your Apple II computer. By the time you finish reading this book you will be able to select, install, configure, and use a hard disk system with AppleWorks, AppleWorks GS, desktop publishing programs, and any other Apple II application. The author describes all the necessary procedures in a logical step-by-step fashion that you will find easy to read and understand.

About the Author:

Dr. Gary R. Morrison is an Associate Professor of instructional design and technology at Memphis State University. He has published more than fifty articles, papers, and books on instructional design and computer based instruction. Dr. Morrison is the co-author of ***Beginning with ProDOS 8 and 16*** and is the author of a series of popular articles on how to use a hard disk with AppleWorks. Those articles appeared in the ***AppleWorks Forum***, the monthly publication of the National AppleWorks Users Group.

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